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FINAL ENVIRONMENTAL IMPACT STATEMENT

Clackamas, Douglas, Jefferson, Lane,
Linn, and Marion Counties, Oregon

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ABSTRACT

This Final Environmental Impact Statement (FEIS) describes the seven alternatives for the Land and Resource Management Plan for the Willamette National Forest. The total area of the Willamette National Forest is 1,675,408 acres.

This FEIS has been prepared following public review periods for the Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan, during which 177,701 comments were received and considered. The seven alternatives of the FEIS acknowledge the substantive public and other agency comments received. Each alternative responds differently to identified major issues and concerns. The alternatives are: (NC) Continuation of management under the 1977 Land and Timber Management Plan; (A) continuation of management under the 1977 Plan modified to meet Management Requirements (National Forest Management Act of 1976); (D) an emphasis on nonmarket resource values, particularly wildlife habitat, with a moderate emphasis on commodity production; (J) a moderate emphasis on nonmarket resource values with an emphasis to maintain commodity production near historic levels; (K) a high emphasis on commodity production with a low emphasis on most nonmarket resource values (high emphasis on developed recreation); (L) a high emphasis on nonmarket resource values reflected by preservation of many areas in a natural condition and a low emphasis on commodity production; (W) a moderate emphasis on both nonmarket resource values and commodity production, with a slightly greater emphasis on nonmarket values such as water quality, diversity of plant and animal species and old growth. Alternative W is the Forest Service Preferred Alternative.

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SUMMARY

INTRODUCTION

The Final Environmental Impact Statement (FEIS) defines and analyzes alternative strategies for management of the Willamette National Forest, one of which has been selected and developed into the accompanying Final Land and Resource Management Plan (Forest Plan).

This is a general summary of the information and analysis contained in the FEIS. It emphasizes the issues and concerns raised by the public and local, state, and Federal agencies regarding the management of the Forest. It briefly describes the purpose and need for the FEIS, the major issues, the seven alternatives, and the environmental consequences of implementation of each of the alternatives. Detailed information and analysis of each of these topics is in the FEIS and its appendices. A thorough reading of the complete FEIS will aid in understanding the Proposed Action which forms the basis for the Final Forest Plan.

This FEIS presents in detail seven different alternatives for managing the lands and resources of the Forest. These alternatives explore varieties of ways of responding to issues identified during the planning process. Each alternative represents a unique combination of land allocations, management prescriptions, activity scheduling, and results in different mixes of goods and services, land uses, and environmental effects.

Federal planning regulations require an analytical process which includes an evaluation of various minimum and maximum resource and economic production levels. In addition, a wide range and relatively even distribution of alternatives must be developed to respond to issues and to reflect national goals such as the Resources Planning Act (RPA) program.

In some alternatives the Forest would be managed to emphasize the production of commodities with a market price. Other alternatives would emphasize resources that do not have a market price, such as dispersed recreation, wildlife, and scenery. One alternative, the No Change Alternative, reflects current management direction projected into the future. Another alternative, the No Action Alternative, reflects current management direction projected into the future including NFMA requirements. Two alternatives were developed in response to requests from public interest groups. One alternative was developed in response to public comments on the DEIS.

The basis for developing alternatives is outlined in the implementing regulations of the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA).

AFFECTED ENVIRONMENT

The Willamette National Forest is an administrative unit of the Pacific Northwest Region of the Forest Service, U.S. Department of Agriculture, and is located within the Second, Fourth, and Fifth United States Congressional Districts. It lies primarily in Lane, Linn, and Marion Counties, but also extends south into Douglas County, east into Jefferson County, and north into Clackamas County. The Forest

headquarters is the Supervisor's Office located in Eugene, Oregon. There are seven Ranger Districts, with offices in Oakridge, Westfir, Lowell, Blue River, McKenzie Bridge, Sweet Home, and Detroit (Figure S-1), Vicinity Map).

The Forest stretches for 110 miles along the western slopes of Oregon's Cascade Mountains. The western edge of the Forest borders the Willamette Valley from east of Salem to the Calapooya Mountains northeast of Roseburg. The crest of the Cascade Range defines the eastern boundary of the Forest.

There are over 1.7 million acres within the Forest boundary--1,675,408 acres of National Forest land and 123,330 acres of land in private ownership or managed by other public agencies. Over 380,000 acres of land within the Forest have been designated by Congress as Wilderness.

The physical and social environments that comprise the Forest are determined by a number of distinctive components: geology, climate, soil, water, air, vegetation, fire, fish and wildlife, insects and disease, cultural resources, recreation opportunities and areas, scenery, wild and scenic rivers, wilderness, roadless areas, special interest areas, range, roaded areas, facilities, timber, minerals and energy, and the social and economic environment.

Knowledge of the characteristics of the Forest provides an understanding of the land's capabilities and limitations for sustaining various resources and for predicting subsequent effects of management activities.

Physical Environment

The Oregon Cascade Range of the Forest is divided into two major geologic provinces: the Western Cascades Province and the High Cascades Province. These provinces are influenced by the Pacific Maritime climate which is typified by wet, cool winters and mild warm summers. Composition and origin of Forest soils, along with climate and geology, are fundamental components of the environment. Generally, Forest soils are volcanic in origin and composed of basalts, andesites, and intrusions of various kinds. Water, another fundamental component, draining from Forest lands is generally of high quality and provides for municipal and domestic uses, fish hatcheries, electricity, recreation, fish and wildlife habitat, and supports the vegetative environment.

There are a number of plant communities on the Forest including coniferous forests primarily of Douglas fir, grand fir, western hemlock, and Pacific silver fir; meadows; and subalpine and alpine parklands and wetlands. Fire regimes have played a key role in the development of these plant communities through time. Factors such as fire frequency, duration, intensity, and size all have had a bearing on Forest ecosystems. Fish and wildlife are abundant on the Forest and adapted to a variety of habitats. Of the 30 species of fish on the Forest, most are native to the natural streams and lakes of the western slope of the Cascades. The diversity of habitats supports over 260 wildlife species including 170 avian breeding species, 64 mammalian species, and 30 amphibian and retilian species.

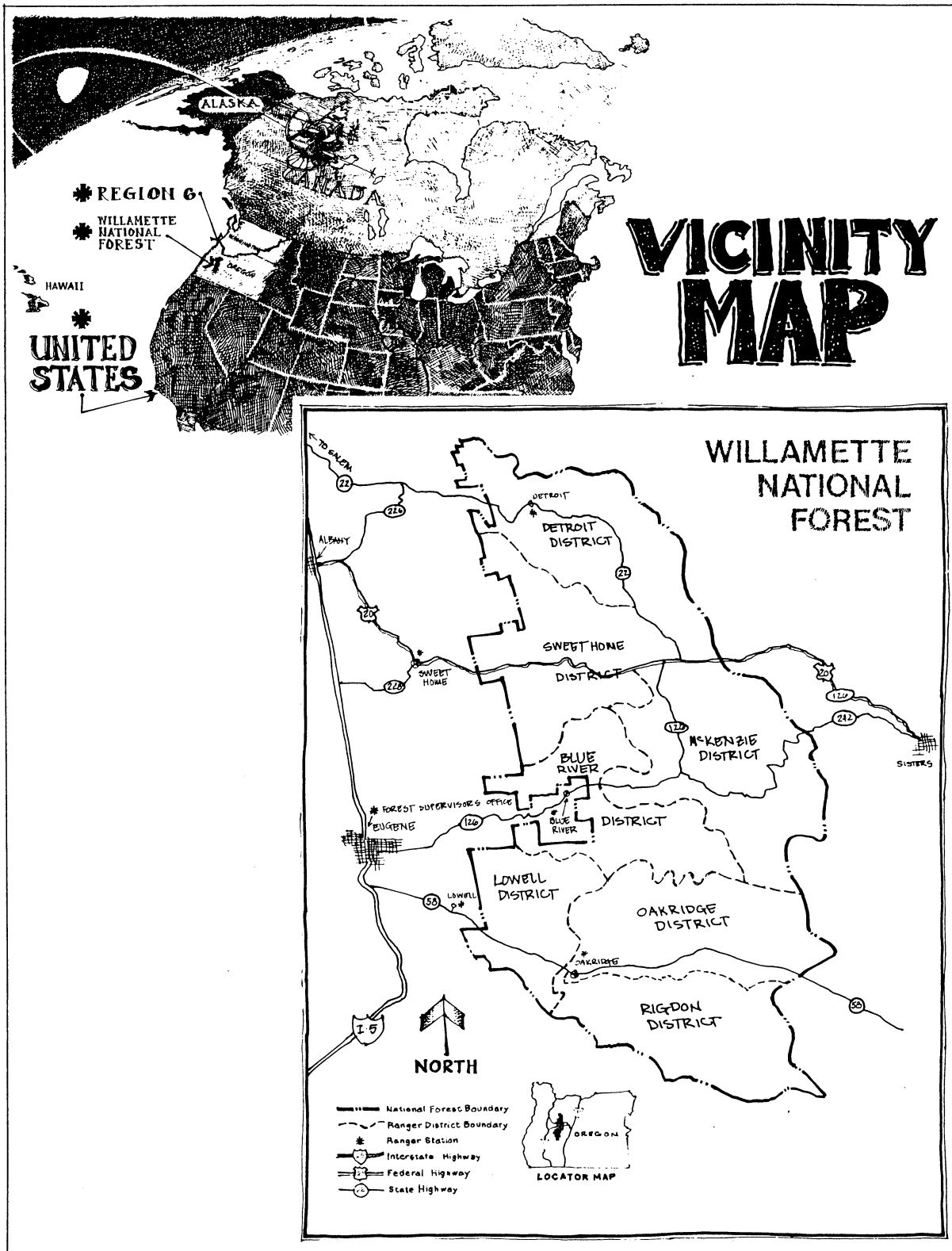
Environments retained in a natural or wild state are represented by wilderness lands and some Forest rivers. There are eight designated Wildernesses on the Forest along with several river segments that are characterized by outstandingly remarkable values and remain free-flowing.

Social Environment

The Forest offers a diversity of social settings as well as natural environments. In addition, within the Forest boundaries is evidence of past and current human use. Human use of lands and resources in

and around the Forest extends over approximately 8000 years. More recent populations utilize Forest lands in ways distinct from the prehistoric populations. Today, Forest users can choose from a wide spectrum of recreation opportunities ranging from primitive to roaded modified settings to developed ski areas or visit and enjoy special interest areas, old-growth groves, and National natural landmarks.

Many local communities rely on the employment and income generated from the use of Forest resources. A measure of stability is derived from a continuous supply of timber being available for harvest from the Forest even though supply is not the only determinant of stable markets. Income and employment are also derived from people traveling through communities on their way to Forest lands for recreation. An awareness of tourism's importance as a source of future economic and social activity for communities in and adjacent to the Willamette Valley is growing.


ALASKA
CANADA
REGION 6
WILLAMETTE NATIONAL FOREST
HAWAII
UNITED STATES
VICINITY MAP
WILLAMETTE NATIONAL FOREST
TO SALEM
ALBANY
DETROIT
DETROIT DISTRICT
SWEET HOME
SWEET HOME DISTRICT
McKENZIE DISTRICT
SISTERS
BLUE RIVER
FOREST SUPERVISOR'S OFFICE
EUGENE
BLUE RIVER DISTRICT
LOWELL
LOWELL DISTRICT
OAKRIDGE DISTRICT
OAKRIDGE
RIGDON DISTRICT
I 5
NORTH
National Forest Boundary
Ranger District Boundary
Ranger Station
Interstate Highway
Federal Highway
State Highway
OREGON
LOCATOR MAP

PURPOSE AND NEED

National Forest System Land and Resource Management Planning is a process for developing, adopting, and revising land and resource management plans for the National Forest System as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 and as amended by the National Forest Management Act (NFMA) of 1976. The resulting Land and Resource Management Plans (Forest Plans) provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits while responding effectively to public issues in an environmentally sound manner. The National Forest System Land and Resource Management Planning process is described in Title 36, Part 219 of the Code of Federal Regulations.

This Final Environmental Impact Statement (FEIS) document discloses the analysis and the significant environmental effects of seven alternatives including a proposed action, for the future management of land and resources of the Forest. The purpose of the FEIS is to provide decisionmakers with an environmental disclosure sufficiently detailed to aid in the selection of a Forest Plan which delineates new management direction for the Forest. Equally important, its purpose is to make information available to the public and to encourage public participation regarding implementation and refinement of that direction.

The Preferred Alternative is the "proposed action" (40 CFR 1502.14) for this FEIS and is the basis for the "Willamette National Forest Land and Resource Management Plan" document (Forest Plan). The alternatives presented in this FEIS contain management direction for the next 10 to 15 years. The Forest Service is required to revise the plan within 15 years of its adoption; revision may establish different long-term goals with different projected effects and outputs. The Plan may also be revised or amended, if needed, prior to the scheduled revision date.

The preparation of an Environmental Impact Statement is required because the Forest Plan is a major Federal action which may have a significant effect on the quality of the human environment. Its development follows the direction of the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality NEPA Regulations (40 CFR 1500-1508). For purposes of disclosure under NEPA, the FEIS and the accompanying Forest Plan are treated as combined documents.

PUBLIC ISSUES

By the time of publication of the DEIS, modifications were made to the 1981 list of primary issues resulting in a revised list that included dispersed recreation; developed recreation; wilderness; cultural resources; livestock grazing; logging residue; air quality; minerals; energy; individual well-being; local economies; economic efficiency;old-growth; roadless lands; scenic quality; timber supply; water quality and quantity; wildlife, fish and plant habitat. These modifications were made to reflect refinements in public opinion during that interval and to reduce complexity within the planning documents. In some cases, interrelated issues were grouped together. Other topics, such as old-growth and roadless lands, had vastly increased in public interest.

While all of the issues were considered during development of the DEIS alternatives, the degree of response to the major ones was of greatest importance in selecting the Preferred Alternative for the Draft Forest Plan. Issues were considered of major importance if they were the subject of continually recurring correspondence, individual visits, or meetings involving other public agencies, organized groups and industry, or the public at large. These issues were also often discussed in media reports. The major issues that provided the focus for the DEIS were Dispersed Recreation; Old Growth; Roadless Lands; Scenic Quality; Timber Supply; Water; and Wildlife, Fish, and Plant Habitat.

The following is a brief discussion of the seven major issues which were the subject of special focus in the DEIS. These issues with some refinements remain the major issues considered in the FEIS and Final Forest Plan.

Dispersed Recreation

Demand for recreation opportunities on the Forest remains high. People are interested in maintaining a wide variety of options for recreation activities. The subject of roaded and unroaded dispersed recreation opportunities carry the greatest potential to vary among Alternatives. There is concern about how the management decisions made in the Forest Plan will increase or decrease these opportunities.

There is continuing, although somewhat less intense, interest in managing for developed recreation, as well. Developed sites are tracked through the process; but they are not treated as a major issues, because there is less land involved and less intensity of public interest. Decisions made regarding developed recreation have a low significance in affecting the overall management of other Forest resources.

Old Growth

In the early stages of development of this Forest Plan, the management of old-growth stands was considered part of the timber production and fish and wildlife habitat issues. By the publication of the DEIS, however, increasing public attention had warranted treating it as a separate category despite its particularly strong interrelationships with other issues.

Part of the public sees a need to preserve old growth for its benefits to plant and wildlife habitat diversity, soil and water productivity, and its recreational and aesthetic values. Another segment of the public recommends utilizing old growth for its high value timber products, at the same time converting the old growth stands to more vigorously growing second growth stands to support future timber production needs.

Roadless Lands

Although the Oregon Wilderness Act of 1984 resolved part of the issue concerning Wilderness, interest in some of the Forest's roadless lands has remained high. "Wilderness" as an issue was rated highly important by the 1981 respondents. In 1983 a reinventory of the roadless lands on the Forest included extensive public involvement, including a 1200-piece mailing and a series of public meetings. The 1984 Act increased the amount of designated Wilderness on the Forest to about 25% of the total land base.

The nature of the roadless lands issue revolves around using these lands for timber production; or deferring harvest to preserve old growth trees, provide habitat diversity, provide dispersed recreation opportunities, and protect aesthetic values. A no-harvest allocation assigned to unroaded areas would also maintain options for future designation as Wilderness. Some people feel that the marketable resources in these areas should be developed; some feel that they should remain undeveloped. Still others feel that some lands currently in a developed condition should be returned to an undeveloped condition, particularly if the lands are adjacent to designated Wilderness.

Scenic Quality

The visual quality of the Forest landscape is of concern to adjacent landowners, travelers, and Forest visitors. Many people prefer not to see evidence of timber harvesting from major highways and popular

recreation areas such as trails, campgrounds, and scenic overlooks. Other people, who tend to favor utilization of Forest resources, feel that most visual effects of resource management activities are temporary, so that Visual Quality Objectives should play a reduced role in planning such activities.

Timber Supply (Current and Future Timber Production)

The Forest annually provides the largest amount of timber production in the National Forest System. The amount of timber produced on the Forest therefore assumes some level of national as well as local importance. In addition, since the wood products industry is one of the three major components of the economy of the State of Oregon, concern has also been high for several years about the level of contribution the Forest's timber resource makes to the overall timber supply within the State, as well. In the 1981 survey current and future timber production received the highest weighted importance. Interest has remained high since then.

Some people feel that the allowable harvest is too high, resulting in unacceptable adverse effects to other resource values. Others believe that the level of harvest should be maintained or increased to provide the raw material to help satisfy demand for wood products and to provide a stabilizing force on the economies of local communities which may be highly dependent upon the various wood products industries.

Additional components of the timber supply issue include: logging residues and firewood, harvest schedules and methods, use of herbicides and fertilizer, reforestation, species mix, and access.

Water Quality and Quantity

Water quality received the second highest rating for issue importance in the 1981 issue development survey. The natural level of water quality on the Forest is generally quite high. Consequently, unlike many of the other issues addressed by the Forest Plan, the concern centers more on minimizing degradation than taking specific actions to enhance the resource over natural levels. Accordingly, much of the treatment given this issue can be found in the Standards and Guidelines and Monitoring sections of the documents.

Water quantity was of less concern than quality. Adequate and consistent water supply for streamflow for fish habitat and domestic uses was of greatest concern.

Wildlife, Fish, and Plant Habitat

The broad issue of habitat represents a complex of concerns about the living components of the Forest. Central to the issue are matters of species survival and maintaining ecological diversity.

Concerns range from continuation of game species for hunting and fishing to preservation of reptiles and insects to threatened, endangered, and sensitive plant species. Differences of opinion arise about the extent and nature of land allocations and mitigation requirements associated with various individual, commercial, and management activities which are needed to assure adequate support for the viability and distribution of the various native species.

Issue Refinement Between the DEIS and the FEIS

The key issues did not change between the DEIS and the FEIS, but some refinements in focus occurred, most notably to five of the key issues. Responsiveness to these refinements ultimately led to analysis of three new alternatives in the FEIS.

Dispersed Recreation

A segment of the McKenzie River and the North Fork of the Middle Fork of the Willamette River received Wild and Scenic River designation by Congress in 1988. Congress also required that Blue River and the South Fork of the McKenzie River be studied for their suitability for Wild and Scenic River status. The State of Oregon added two additional rivers to its State Scenic Waterways inventory. Interest in studying additional rivers and their segments for similar designations has intensified.

Special designations of these types affect management practices on the rivers and surrounding lands. Timber harvest, road building, and recreation site development may be constrained or eliminated for some distance from the rivers themselves. Retaining the special values of study rivers pending suitability determination similarly affects the nature and extent of new management activities in those areas until suitability is resolved.

Old Growth

The intensification of public interest surrounding old growth has involved a number of key issues: old growth as forest structure; old growth as a reservoir of timber supply; old growth as an ecosystem providing a unique habitat in support of other plant and animal species.

One of the more perplexing aspects to addressing old growth concerns was the apparent lack of unanimity of definition. Definitions have been proposed by various groups, including USFS - Region 6 (Regional Guide), the Pacific Northwest Range and Experiment Station (PNW 447), the Wilderness Society, and the Society of American Foresters. Data is analyzed and displayed in the FEIS using the USFS Region 6 definition.

Increased attention has focused on the silvicultural values of old growth structure, including its capability to retain and enhance soil and water productivity. This attention has not limited its scope to preservation of existing stands. Indeed, interest in old growth structure has been instrumental in the development of changing philosophies of site utilization and stand regeneration techniques, known as "New Forestry" and "New Perspectives in Forestry."

Differences in public and professional opinion exist about the extent to which increased preservation of old growth and "New Perspectives" forestry should occur; the specific nature of indicated practices; the best locations in which to undertake the practices; and the attendant risks involved, such as susceptibility to fire and disease.

Timber Supply

The timber supply issue intensified to near-crisis proportions during the period between the DEIS and the FEIS. Although the values of harvested timber on the Forest reached all-time highs, the volume sold for eventual harvest dramatically decreased by fiscal year 1989. Much of the reduction in sold volume was in response to court injunctions associated with spotted owl habitat litigation. The current and intermediate term availability of timber from all sources within the State of Oregon achieved

high levels of public concern. Central to this concern was the contribution made by the Federal sector, particularly in the form of old growth timber.

Ultimately, Congress balanced the habitat needs of the spotted owl with the Federal supply needs of old growth dependent mills by passing the Northwest Timber Compromise as Section 318 of the Fiscal Year 1990 Appropriations Act. This legislation was acknowledged not to represent a permanent solution, however. Consequently, the public issues remain for evaluation under the planning process.

In addition, many public comments alerted the Forest to improvements which could be made to the technical analysis of timber availability.

Water Quality and Quantity

Public comments during the response period after publication of the DEIS sent a strong message that many of the alternatives in the DEIS, including the preferred alternative, proposed unacceptable levels of watershed degradation. This did not so much represent a refinement of public concern as it represented a reaffirmation of the intensity with which the concern was held and the need for the Forest to address the issue with greater sensitivity.

Wildlife, Fish, and Plant Habitat

During the interval between the DEIS and FEIS, concerns surrounding plant and animal diversity and habitat preservation intensified. These concerns spanned a wide variety of species, habitats, and management practices. The most notable representatives of these concerns were spotted owl habitat, old growth as a reservoir of a unique and valuable ecosystem, and riparian areas as critical ecosystems.

These issues were central to examining notions such as habitat connectivity and preserving options. In many cases, however, decisions to provide or enhance such connectivity or to preserve options produce reductions in timber supply or suggest relatively more costly harvest techniques.

DEVELOPMENT OF ALTERNATIVES

The following section describes how resource issues were identified and developed into a range of alternative land allocations and management direction responsive to the National Forest Management Act, National Environmental Protection Act, and the public.

Information on the amount and location of resources has been compiled through inventories of timber conditions, recreation use, wildlife populations, soil and water resources, and roads. These inventories were combined in the Geographical Mapping System (GMS) for use in the development and analysis of alternatives. This information was collected on a common map base, with different map layers developed for the various resources and inventory components. This data base was updated between the DEIS and FEIS to reflect changes in land suitability, timber harvest and growth, and a revision of the spotted owl, pileated woodpecker, and pine marten habitat networks.

The alternative formulation process began in November 1984 with a review of Forest issues, concerns, opportunities and resource inventories; resource production capabilities identified in the analysis of the management situation; and applicable planning direction. Based on a review of these items resource management options were developed for nine resource areas: Recreation; Fish and Wildlife; Timber; Range; Soil, Water, and Air; Minerals and Energy; Lands; Facilities; and Protection. Each option was comprised of management direction statements for the important factors for that resource. The resource management options were designed to incorporate issues, reflect a particular level of management emphasis, and serve as a potential building block for Forest management alternatives.

The draft resource management options were reviewed by the public during 1985, with the knowledge that these options would be used as building blocks for alternatives. Public response was evaluated and the resource options were modified to reflect public comments. The resulting options were utilized in the development of preliminary alternatives.

A review of the options for the nine resource areas indicated that some resources relate primarily to the allocation of land and scheduling of timber harvests for achievement of their objectives (Timber, Recreation, and Fish and Wildlife), while other resources are primarily dependent on program budget and/or administrative action (Facilities).

From the combinations of resource option descriptions nine preliminary alternative descriptions were written and rough estimates of some outputs were made. Two preliminary alternatives were dropped due to significant overlap and duplication. Subsequently, seven alternatives were examined as to how well they resolved Forest issues.

Two alternatives required by NFMA regulations, No Action and one demonstrating ability to meet the goals of the Resource Planning Act (RPA), were added to the list for consideration at this time. Two additional variations on preliminary alternatives were developed which allowed for departure from long-term sustained yield. Due to significant overlap and duplication, three preliminary alternatives were dropped leaving eight alternatives in the DEIS. In June of 1987 a ninth alternative was included in the array of alternatives in response to decisions made regarding an appeal brought by the Northwest Forest Resources Council. In the DEIS, the ninth alternative is referred to as the "No Change" (NC) alternative and is based on the potential yield of the Forest's 1977 Timber Management Plan.

During the review period for the DEIS, many comments were received indicating how well the public felt the key issues were addressed by the alternatives. A large number of the commentors expressed the opinion that not all reasonable and viable means of addressing the issues were considered (or at

least considered in sufficient detail) in the DEIS. With public comments for direction, the Forest IDT and management team revisited the alternative formulation process used in the development of the DEIS. The resource options, the management prescriptions and the acre allocations were reviewed and revised. The result of the revisions were three additional alternatives in the FEIS that were not considered in the DEIS.

CHANGES BETWEEN THE DRAFT ENVIRONMENTAL IMPACT STATEMENT AND THE FINAL ENVIRONMENTAL IMPACT STATEMENT.

The DEIS and Proposed Forest Plan documents were available for public review from January to May 1988. The public review process and comments received during this period are described in the FEIS Chapter I, Appendix A, and Appendix I. After the public comment period had closed and the comments had been reviewed, the Forest interdisciplinary team (IDT) explored ways to respond to public concerns.

Many of the comments suggested that:

- Alternatives be modified;
- Alternatives be developed or evaluated that were not given adequate consideration in the DEIS;
- Analyses presented in the DEIS be supplemented, modified, or improved;
- Factual corrections be made in information or data used in the analyses.

After reviewing these comments, the IDT and Forest management team agreed on changes that should be made in the FEIS. In some cases, the changes involved analysis methods and data common to all of the alternatives. Other changes involved considering alternatives not analyzed in the DEIS while dropping others that had been analyzed. The new alternatives were developed based on public response to specific issues and the proposed resolution of these issues displayed in the DEIS. The new alternatives propose different land allocations, management prescriptions, and standards and guidelines from the set of alternatives analyzed in the DEIS as means of resolving those issues.

The IDT updated or reanalyzed all of the alternatives considered in the FEIS. As a result, a new Preferred Alternative was identified: Alternative W. The Forest Plan was revised to reflect the proposed changes between Alternative J, the Preferred Alternative in the DEIS, and Alternative W. The Plan and the FEIS were submitted to the Regional Forester for review.

Following is a summary of revisions made between the DEIS and FEIS to respond to concerns raised during the public comment period.

- Alternatives B and J-Departure were dropped from the set of alternatives considered in detail. Both proposed a timber sale schedule that departed from long-term sustained yield capacity. Public responses were largely indifferent to the departure alternatives as a means of addressing the timber supply issue. Concerns were raised, however, about the environmental effects associated with the departure alternatives. Environmental effects of the departure alternatives were generally the most adverse of the range of alternatives considered in the DEIS (see Chapter IV, DEIS).

- Alternatives C and I were also dropped as alternatives considered in detail in the FEIS. While there was a moderate amount of favorable public comments on both of these alternatives, other alternatives were proposed and considered in the FEIS that address similar goals and objectives.

- Alternative K was added in response to public comments. Many individuals, as well as timber industry organizations, expressed a desire for an alternative that would maintain the timber harvest near the level in the current plan (1977). Although similar to Alternative I in the DEIS in some respects, differences in specific resource goals and objectives led to developing Alternative K. The Willamette Forestry Council (WFC) played a major role in advising on the development of Alternative K.

- Alternative L was also added in response to public comments that noncommodity uses of the Forest were not adequately represented in the alternatives in the DEIS. Many people were concerned that an alternative proposed by the Oregon Natural Resources Council (ONRC) for the DEIS was not fully analyzed. Alternative L was developed with suggestions from ONRC and affiliated groups.

- Alternative W (Preferred Alternative) was added to the set of alternatives largely in response to comments on Alternative J, the PA in the DEIS. Although the initial thought was to modify Alterative J in response to the criticism, it became apparent that the significance of the changes in specific resource practices as well as overall goals and objectives were as great as the differences between some of the alternatives considered in the DEIS. A new alternative was developed to help clarify the differences.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Seven alternatives are considered in detail in the FEIS: Alternatives NC, A, D, J, L, K, and W. These offer differing approaches as to how land and resources of the Forest could be managed. Each contain a set of land allocations, management practices, and activity shedules which, when implemented, would result in a unique combination of resource outputs and environmental consequences. Together, they present a broad range of possible management alternatives.

ALTERNATIVE NC (No Change)

The No Change (NC) Alternative represents implementation of the Forest's existing Land Management and Timber Management Plan to achieve timber production at potential yield levels.

The No Change Alternative has been developed in response to decisions made regarding Appeal Number 1588, brought by the Northwest Forest Resources Council on May 19, 1986. The appeal centered on a decision by Regional Forester James F. Torrence to "require inclusion of Minimum Management Requirements (MMRs) in the No Action Alternative for each Forest Plan." The substance of the appeal was that a "true No Action Alternative representing current management plans" was not included in the DEIS and is not included in the FEIS. In response to this, a No Change Alternative has been developed to represent the existing timber management plan, and consequently does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture to implement NFMA.

ALTERNATIVE K

Alternative K represents a low emphasis on nonmarket values and a high emphasis on commodity production. The management philosophy of this alternative is one which emphasizes a public understanding of the practices which are undertaken to maximize production of market goods from the forest, under multiple-use principles. The focus is to maintain high levels of timber harvest by making most of the Forest's tentatively suited land available for timber production. The objective is to maintain a timber supply level equal to the historical levels. This Alternative was formulated with input from the Willamette Forestry Council (WFC).

Roadless areas not designated as Wilderness in the 1984 Oregon Wilderness Act would be managed for a variety of multiple use values including timber, except for Bull of the Woods Roadless Area. The visual quality objective would be to allow all types of management activities to be seen in all areas, but the activities would not dominate the views.

Developed recreation would be emphasized with all existing and inventoried potential developed recreation sites being managed and protected. The Forest transportation system would increase, making larger areas accessible for motorized recreation.

An objective would be to maintain water quality by insuring strict adherence to operational Best Management Practices.

ALTERNATIVE A (No Action)

Alternative A represents implementation of the Forest's existing land allocations with the addition of management requirements for wildlife habitat and riparian areas, and updates on inventories of land suitability and timber yield tables. This alternative emphasizes a high level of timber production and a low emphasis on roadless recreation and other non-commodity forest uses.

ALTERNATIVE J

Alternative J represents a moderate emphasis on nonmarket resources and on commodity production. The focus is to balance the need for timber supply at near historical levels while maintaining several important roadless areas, important old-growth areas, and scenic values in a way that provides some degree of issue resolution for each. This was the Preferred Alternative of the DEIS.

ALTERNATIVE D

Alternative D represents a high emphasis on non-market resources with a moderate emphasis on commodity production.

Habitat for management indicator species pileated woodpecker, martens, and spotted owls would exceed levels required for Management Levels. Many areas would be managed for high quality big game habitat, and many unique special wildlife habitat areas would be recognized.

Dispersed Recreation would be emphasized by maintaining several roadless areas in their current condition. The scenic quality from many major highways would remain natural.

Riparian areas would be managed to provide input of near-natural levels of large woody material for fish habitat maintenance and improvement.

ALTERNATIVE L

Alternative L places a high emphasis on nonmarket values, and low emhasis on timber commodity values by preserving areas currently not highly impacted by past management activities in their natural condition and by proposing other areas for natural recovery from the effects of past management. This alternative was formulated with input from the Oregon Natural Resources Council (ONRC).

High levels and quality of recreation opportunities and experiences would be provided. Scenery would be enhanced by managing all areas according to Visual Quality Objectives and by rehabilitating unacceptable modifications.

The full inventory of roadless areas would be maintained in an undeveloped condition with an emphasis on semi-primitive nonmotorized activities. Opportunities for high quality wilderness experiences would be increased by proposing additional areas for Wilderness study and for Wilderness designation.

The quantity, quality, and diversity of plant and animal communities would be maintained at high levels. All management requirements for pileated woodpeckers, martens, and spotted owls would be exceeded and habitat would be provided for the full inventory of verified Spotted Owl pairs. All areas of diverse habitats, geologically significant areas, and "millenium" old-growth groves would be managed

to protect and enhance desirable attributes. Old-growth characteristics would be retained in all managed stands.

Riparian areas would be managed to maintain and enhance riparian dependent species and connective corridors across the landscape.

ALTERNATIVE W (Preferred Alternative)

This alternative is designed to provide a healthy, diverse, and productive ecosystem that would ensure the capability of the Forest to produce a continuous flow of a variety of goods and services to the public over the long-term. Alternative W was formulated to respond to public comments to the DEIS.

The ability to provide a dependable supply of timber to the market would continue. This alternative recognizes the importance of maintaining old-growth characteristics in some managed stands. Where timber production is either reduced below biological potential or removed from scheduled timber production to recognize other resource goals and benefits, this alternative would emphasize the use of these areas to support complementary resource goals such as wildlife, dispersed recreation, watershed protection, biological diversity and ecological studies.

Additional recreation opportunities would include expanding activities compatible with areas withdrawn from timber harvesting as well as providing opportunities such as low elevation hiking trails within areas intensively managed for timber production.

A special emphasis of this alternative would be to recognize the role of river corridors and streamside zones on the Forest as critical components in the ecosystem. Management activities in these areas would focus on maintaining and enhancing the long term productivity, first, for those uses dependent on rivers and streams and secondly, for other resources. Timber scheduling would be responsive to the cumulative effects of watershed conditions.

Table S-1. Resource Outputs, Effects, Activities, and Costs

Output/Effects	Unit	Decade	Alternatives						
			NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Water									
Low Watershed Impact	% Area	1	NA	44	47	65	100	78	100
Moderate Watershed Impact		1	NA	27	25	17	0	10	0
High Watershed Impact		1	NA	29	28	18	0	12	0
Erosion (Debris Slides)	M Cu-Yd	1	NA	85.6	80.3	67.0	34.0	33.4	23.9
Water Yield	M Ac-Ft	1	8,895	8,895	8,895	8,895	8,895	8,895	8,895
		2	8,895	8,895	8,895	8,895	8,895	8,895	8,895
		5	8,895	8,895	8,895	8,895	8,895	8,895	8,895
Lands Tentatively Suitable for Timber Production	M Acres	-	1,136.4	1,032.1	1,032.1	1,032.1	1,032.1	1,032.1	1,032.1
Lands Suitable for Timber Production	M Acres	-	1,064.6	932.8	874.3	853.4	774.6	719.4	553.1
Lands by Timber Yield Levels									
Full Yield (95-100%)	M Acres	-	918.7	797.0	743.4	719.6	689.2	638.9	314.3
75-94% of Full Yield	M Acres	-	54.0	70.3	71.3	72.6	42.9	40.4	74.9
50-74% of Full Yield	M Acres	-	91.9	65.5	59.6	61.2	42.5	40.1	89.0
1-49% of Full Yield	M Acres	-	0	0	0	0	0	0	74.9
Tentatively Scheduled Timber Harvest									
Clearcut [2]	M Acres	1	14.4	12.6	12.1	10.2	9.1	9.9	3.3
		2	NA	12.6	12.1	10.0	9.4	10.0	2.8
		5	NA	11.8	11.6	8.2	8.1	8.5	2.3
Commercial Thin	M Acres	1	4.2	3.1	3.2	2.6	2.8	2.7	0.2
		2	NA	0.2	0.2	1.7	2.1	0.3	0.9
		5	NA	2.8	1.3	10.1	6.8	5.5	4.9
Reforestation	M Acres	1	14.4	12.6	12.1	10.2	9.1	9.9	3.3
		2	NA	12.6	12.1	10.0	9.4	10.0	2.8
		5	NA	11.8	11.6	8.2	8.1	8.5	2.3
Timber Stand Improvement [3]	M Acres	1	12.9	21.3	20.7	20.4	18.1	19.3	8.1
		2	NA	22.8	22.8	18.3	17.7	18.0	5.8
		5	NA	21.7	21.7	16.7	17.8	15.5	5.4
Timber Sale Program Quantity [4]	MMBF	1	1,013	799	748	652	604	586	185
		2	NA	810	760	654	596	597	190
		5	NA	621	555	558	495	438	142

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Timber Sale Program Quantity [4]	MMCF	1	183	144	135	116	107	105	33
		2	NA	144	135	116	107	106	33
		5	NA	127	117	110	98	92	30
Allowable Sale Quantity [5]	MMBF	1	810	650	608	530	491	476	150
		2	810	658	618	532	484	486	155
		5	810	573	532	481	440	407	129
Allowable Sale Quantity [5]	MMCF	1	146	117	110	95	87	86	27
		2	146	117	110	95	87	86	27
		5	146	117	110	95	87	86	27
Long-Term Sustained Yield	MMCF	-	146.0	120.0	113.5	107.8	94.7	93.8	34.2
Firewood [6]	M Cords	1	71.9	57.0	53.6	46.2	42.4	41.8	13.5
		2	NA	57.0	53.6	46.2	42.4	41.9	13.5
		5	NA	24.2	19.2	33.8	25.0	16.4	6.8
Timber Growth in 5th Decade	MMCF	-	NA	112.1	105.9	102.8	88.9	91.0	33.9
Old Growth at End of Decade[7]	M Acres	1	494.0	522.4	528.4	534.9	533.4	537.2	578.3
		2	NA	449.7	460.9	473.6	479.1	478.4	558.1
		5	259.8	305.1	337.0	341.1	365.2	367.8	523.1
Fuel Treatment	M Acre	1	8.6	7.6	7.3	6.1	5.5	5.9	2.0
		2	NA	7.6	7.3	6.0	5.6	6.0	1.7
		3	NA	7.1	7.0	4.9	4.9	5.1	1.4
Anadromous Smolt Habitat Capability	M Smolt	1	NA	409	410	411	438	433	437
		2	NA	536	536	538	572	567	572
		5	NA	536	536	538	572	567	572
Resident Fish Production Capability	M Legal Size	1	NA	2427	2427	2427	2506	2506	2506
Bald Eagle	Protected Sites[8]	-	21	21	21	24	24	27	27
Spotted Owl Habitat Areas	Areas	-	NA	59	59	59	59	102	184
Pileated Woodpeckers	Areas [9]	-	NA	156	156	156	156	274	355
Marten	Areas [9]	-	NA	256	256	256	256	412	438

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Primary Cavity Excavators	% Bio. Poten-tial	1	NA	40	38	41	43	44	49
		2	NA	43	43	43	45	46	49
		5	NA	40	41	42	45	45	49
Elk	PTI [10]	1	NA	1.0	1.1	1.2	1.3	1.5	1.5
		2	NA	0.97	1.2	1.3	1.6	2.0	1.9
		5	NA	0.91	1.2	1.2	1.5	2.4	1.9
Deer	PTI [10]	1	NA	1.0	1.1	1.3	1.4	1.6	1.5
		2	NA	0.98	1.2	1.6	1.7	2.1	2.0
		5	NA	0.96	1.2	1.3	1.6	2.5	2.0
Consumptive Wildlife Use	MWFUDs	1	NA	108	117	129	145	157	157
		2	NA	104	125	145	177	217	206
		5	NA	99	125	129	168	263	206
Nonconsumptive Wildlife Use	MWFUDs	1	NA	704	758	841	941	1021	1021
		2	NA	674	811	941	1153	1338	1409
		5	NA	644	811	841	1049	1338	1708
Acres of Unroaded Areas Still Meeting Roadless Definitions at the End of the Decade.	M Acres	1	84.9	104.9	70.8	42.0	52.7	0.8	16.3
		2	45.7	65.7	22.7	23.2	30.6	0.0	12.9
		5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unroaded Areas Assigned to Unroaded Rx	M Acres	-	45.4	25.3	59.8	79.7	92.1	136.9	145.9
Visual Quality Objectives									
Preservation	M Acres	-	437.9	503.8	547.4	586.4	591.1	647.7	912.8
Retention	M Acres	-	88.6	72.0	77.9	90.5	118.8	142.1	265.1
Partial Retention	M Acres	-	114.3	147.5	150.1	177.7	171.7	245.7	286.3
Modification	M Acres	-	4.5	123.6	4.5	206.2	143.0	108.4	4.5
Maximum Modification	M Acres	-	1,030.1	828.6	895.4	614.6	650.8	531.6	210.6
Trail Construction	Miles	1	0	0	0	4.0	6.0	6.8	4.0
		2	0	0	0	0	0	0	0
		5	0	0	0	0	0	0	0
Trail Reconstruction	Miles	1	68	68	68	70	72	72	70
		2	68	68	68	70	72	72	70
		5	68	68	68	70	72	72	70
Developed Site Construction	PAOT	1	0	390	0	51	327	120	0
		2	0	390	0	20	56	55	0
		5	0	390	0	0	25	0	0

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Developed Site Reconstruction	PAOT	1	844	844	844	844	844	844	844
		2	844	974	844	861	953	884	844
		5	844	1040	844	868	1014	902	844
Developed Recreation Use [11]	MRVDs	1	2,056	2,056	2,056	2,056	2,056	2,056	2,056
		2	2,539	2,953	2,539	2,799	2,953	2,830	2,539
		5	2,539	4,481	5,539	2,799	3,073	2,830	2,539
Wilderness Recreation Use [11]	MRVDs	1	352	352	352	368	342	207	370
		2	415	415	415	401	342	269	447
		5	436	436	436	412	342	283	460
Nonwilderness Dispersed Recreation Use[11] [12]									
Semiprimitive Nonmotorized Use	MRVDs	1	52	7	50	54	52	70	52
		2	52	7	50	54	52	90	52
		5	52	7	50	54	52	90	52
Semiprimitive Motorized Use	MRVDs	1	50	64	49	64	64	64	64
		2	50	93	49	69	76	80	93
		5	50	111	49	69	76	80	126
Roaded Natural Use	MRVDs	1	1,054	1,278	1,278	1,278	1,278	1,278	1,278
		2	1,054	1,694	1,764	1,880	1,880	1,880	1,880
		5	1,054	1,694	1,764	2,194	2,310	2,853	2,853
Roaded Modified Use	MRVDs	1	376	376	376	376	376	376	376
		2	553	553	553	553	553	553	382
		5	839	839	839	839	839	839	382
Road Construction	Miles	1	82	55	50	45	40	30	12
		2	36	9	13	7	7	5	4
		5	0	4	5	4	2	1	1
Road Reconstruction	Miles	1	236	222	204	178	174	153	81
		2	NA	220	202	176	171	151	79
		5	NA	220	202	176	171	151	79
Roads Suitable For Public Use									
Passenger Car	Miles	1	1,735	1,580	1,610	1,600	1,580	1,580	1,580
		2	NA	1,585	1,660	1,640	1,585	1,585	1,585
		5	NA	1,585	1,670	1,650	1,585	1,585	1,585
High Clearance Vehicles Only	Miles	1	4,600	4,600	4,560	4,530	4,530	4,500	4,200
		2	NA	4,700	4,770	4,700	4,550	4,520	4,220
		5	NA	4,760	4,820	4,740	4,570	4,550	4,230
Closed to Motor Vehicles	Miles	1	1,085	970	930	920	890	820	935
		2	NA	955	800	820	935	845	955
		3	NA	1,105	910	910	1,045	865	985

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Total Budget (1982 $)	Million $	1	NA	62.6	58.2	52.2	49.2	49.6	26.4
		2	NA	56.1	52.5	47.8	46.2	45.5	25.0
		5	NA	55.7	51.4	49.5	45.2	46.1	26.3
Present Net Value (15 Decade Total)	Million $	-	NA	3,503	3,184	3,060	2,858	2,780	1,607
Returns to Government	Million $	1	166.2	128.6	119.9	106.1	101.2	91.8	32.4
		2	NA	151.6	141.5	122.6	108.0	109.9	40.3
		5	NA	143.7	130.2	135.6	117.6	97.8	32.5
Payments to Counties	Million $	1	41.6	32.2	30.0	26.5	25.3	23.0	8.1
		2	NA	37.9	35.4	30.6	27.0	27.5	10.1
		5	NA	35.9	32.6	33.9	29.4	24.4	8.1
Change in Jobs (Relative to Historic level = 13,257)	Number	1	5,653	2,945	2,219	900	204	-167	-5,499
Change in Jobs (Relative to Alternative NC = 16,303)	Number	1	--	-2,078	-3,434	-4,753	-5,449	-5,820	-11,152
Change in Income (1982 $) (Historic Level = 340.4)	Million $	1	155.7	73.9	52.7	14.3	-5.6	-15.1	-172.8

Footnotes for Table II-21.

[1] NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Section D4b, of Chapter II in the DEIS describes these differences.

[2] Approximately 7% of these acres would be shelterwood harvests

[3] TSI includes release from competing vegetation, precommercial thinning, and fertilization.

[4] Includes net green volume plus salvage, cull, unregulated, and miscellaneous convertible products. The average annual amount of timber sold 1977-1986 was 784 MMBF, and the amount harvested was 607 MMBF.

[5] Includes only live, sound wood.

[6] Historically the firewood supply has come from a portion of the cull material, and is included in the Timber Sale Program Quantity above.

[7] Old growth based on the Pacific Northwest Regional Guide definition.

[8] Includes both existing and potential habitat areas.

[9] Areas include contributing habitat from SOHAs and/or pileated woodpecker habitat.

[10] Population Trend Index; Population trend values by decade are compared to a current level of 1.00.

[11] Recreation visitor day use for the No Change Alternative was developed from previous inventories and yield tables and does not incorporate the latest methods of calculating RVD outputs.

[12] RVD outputs for the No Change Alternative are available for total dispersed use.

MRVDs = Thousands of Recreation Visitor Days
PAOT = Persons at One Time
M Acres = Thousand Acres
MWFUDs = Thousand of Wildlife and Fish User Days
M Smolt = Thousand Smolt (Young Anadromous Fish)
PTI = Population Trend Index%/bio-pot = Percent of Bio-potential
AUMs = Animal Unit Months
MMBF = Million Board Feet
MMCF = Million Cubic Feet
M Ac-Ft = Thousand Acre-Feet
Cu. Yds/Yr = Cubic Yards per Year
Additional information about these terms is included in the Glossary

MANAGEMENT AREAS

Management areas are portions of the Forest to which a specific set of management practices are applied and for which standards and guidelines have been developed. Although a specific use or resource may be featured or emphasized in each description, other uses and resources are provided for in the standards and guidelines established for each management area. The alternative maps in the accompanying map packet display the actual management area allocations for each alternative. The management area allocations associated with each alternative are shown in Table S-2.

Table S-2. Management Area Acreage of Alternatives

	Alternatives						
Management Areas	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
1 Wilderness	380,805 [1]						
Management Area 1a	NA	14,482	14,482	3,305	2,111	--	2,316
Management Area 1b	NA	25,958	25,958	36,730	34,958	14,482	81,770
Management Area 1c	NA	41,018	41,018	41,423	43,963	66,976	54,845
Management Area 1d	NA	299,347	299,347	299,347	299,773	299,347	411,234[6]
2 Oregon Cascades Recreation Area							
Management Area 2a	6,058	--	6,058	1,152	1,152	1,152	--
Management Area 2b	--	6,058	--	4,906	4,906	4,906	6,058
3 Experimental Forest							
Management Area 3	15,379	15,379	15,379	15,379	15,379	15,379	15,379
4 Research Natural Area							
Management Area 4	4,245	3,434	4,245	6,655	7,124	6,015	2,197
5 Special Interest Area							
Management Area 5a	1,109	2,751	1,109	19,410	27,942	15,230	3,391
Management Area 5b	--	--	--	3,178	3,178	--	--
6 Wild and Scenic River							
Management Area 6a [2]	--	--	--	--	--	--	--
Management Area 6b	1,237	1,237	1,237	1,237	1,237	1,237	1,237
Management Area 6c	13,225	13,225	13,225	13,225	13,225	13,225	25,788
7 Old-Growth Grove							
Management Area 7	2,730	853	2,730	4,906	6,655	3,029	199,883
8 T & E Species [3]							
Management Area 8	1,472	1,472	1,472	1,472	1,472	1,472	1,472

Table S-2 Cont. Management Area Acreage of Alternatives

	Alternatives						
Management Areas	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
9 Special Habitat [4]							
Management Area 9a	--	82,782	81,075	70,560	69,045	121,248	37,541
Management Area 9b	--	10,857	11,262	10,025	9,513	8,788	7,146
Management Area 9c	--	15,870	15,742	14,867	14,568	13,182	10,601
Management Area 9d	--	9,364	--	14,888	31,355	17,555	35,386
10 Dispersed Recreation							
Management Area 10a	--	--	--	2,090	299	2,794	--
Management Area 10b	17,747	41,849	17,213	15,699	19,645	3,455	28,049
Management Area 10c	--	--	--	7,977	8,873	29,947	38,245
Management Area 10d	15,956	--	12,883	2,112	960	6,911	--
Management Area 10e	55,181	4,949	55,181	72,672	69,898	163,655	93,746
Management Area 10f	--	2,773	--	3,008	3,605	2,901	341
11 Scenic							
Management Area 11a	--	96,369	--	201,227	138,176	86,080	--
Management Area 11b	--	19,218	--	363	256	1,386	--
Management Area 11c	23,529	26,748	19,133	52,322	70,090	114,239	184,057
Management Area 11d	49,294	3,925	41,999	39,844	24,316	41,188	--
Management Area 11e	12,883	7,892	11,134	5,972	8,212	4,074	51,021
Management Area 11f	52,259	41,892	46,457	43,599	36,347	66,998	122,968
12 Developed Recreation							
Management Area 12a	2,218	2,517	2,218	2,304	2,709	2,581	4,266
Management Area 12b	2,112	2,112	2,112	2,368	2,389	2,133	--
13 Special and Administrative Use							
Management Area 13a	3,839	3,839	3,839	3,839	3,839	3,839	4,543
Management Area 13b	704	704	704	704	704	704	--
14 General Forest							
Management Area 14a	1,011,404	825,899	880,225	610,677	646,320	496,928	195,190
Management Area 14a	--	--	--	597	661	597	--
15 Riparian [5]							
Management Area 15	NA	50,637	47,993	45,389	50,552	47,991	43,600

[1] Wilderness Resource Spectrum management is not applicable to the No change Alternative.

[2] All alternatives include 1,207 acres of Wild and Scenic River designation (wild classification) in the Waldo Wilderness. These acres are included in Management Area 1.

[3] Includes Existing nest area habitat only.

[4] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres. Refer to Figure II-4 FEIS for total habitat acres by alternative.

[5] Riparian acres which are not included in other management areas with no programmed harvest are allocated to MA15. Harvest rates in these Riparian Management Acres differ between alternatives, as described in Chapter II, Riparian. Riparian acres in NC are distributed throughout other management areas.

[6] Alternative L recommends designation of 169,360 acres of roadless area as Wilderness or wilderness study areas.

MAJOR TRADE-OFFS AND ECONOMIC COMPARISONS AMONG ALTERNATIVES

One of the primary reasons for developing alternatives is to provide varities of responses to the issues and concerns affecting the Forest and the public. Each alternative represents a unique approach to issue resolution. While all alternatives address the entire range of issues and concerns, none can successfully resolve all of them concurrently. This is because the issues and concerns reflect the full range of desires for, use of, and outputs from a limited land and resource base. Some of these outputs and uses are competitive or mutually exclusive, thus, creating the need for a variety of issue resolution packages or alternatives. The following is a brief and general description of the issue and concern resolution by alternative.

Old Growth

There are currently 594,800 acres which meet the Region Six definition of old growth. The amount of old growth maintained after 5 decades of harvest ranges from 44% in the NC Alternative to 88% in Alternative L. After 5 decades:

NC - Maintains 44%
K - 51%
A - 57%
J - 57%
W - 61%
D - 62%
L - 88%

Dispersed Recreation

The percentage of the Forest's inventoried potential semiprimitive motor and nonmotorized recreation opportunities provided ranges from 33% to 71%.

NC - Maintains 33%
K - 21%
A - 32%
J - 39%
W - 39%
D - 71%
L - 66%

Roadless Lands

Inventoried lands to be maintained in an undeveloped condition range from 26% to 85%.

NC - Maintains 26%
K - 15%
A - 35%
J - 46%
W - 53%
D - 80%
L - 85%

Scenic Quality

The expected future condition of the Forest's 10 major viewsheds varies according to alternative.

NC - One viewshed remains in a natural appearing condition.
K - None of the viewsheds will be maintained in a natural or slightly altered condition.
A - One viewshed will remain in a natural appearing condition.
J - One viewshed will remain in a natural appearing condition.
W - One viewshed will remain in a natural appearing condition.
D - Six of the viewsheds will remain in a natural appewaring condition.
L - Seven viewsheds will remain in a natural appearing condition.

Allowable Sale Quantity

The amount of timber estimated to be sold annually (in million board feet) ranges from 150 MMBF to 810 MMBF. The acres suitable for timber management range from 553,000 to 1,064,000.

NC - This alternative represents the potential yield of the current timber management plan : ASQ 810 MMBF; landbase 1,064,600 acres.
K - ASQ 650 MMBF; landbase 932,800 acres.
A - ASQ 608 MMBF; landbase 874,300 acres.
J - ASQ 530 MMBF; landbase 853,400 acres.
W - ASQ 491 MMBF; landbase 774,600 acres.
D - ASQ 476 MMBF; landbase 719,400 acres.
L - ASQ 150 MMBF; landbase 553,100 acres.

Water Quality

The risk to water quality and stream conditions varies according to alternative.

NC - Approximately 50% of the Forest land is at High Risk of adverse effects to water quality and stream conditions.
K - Approximately 29% high risk; 27% moderate risk; 44% low risk.
A - Approximately 28% high risk; 25% moderate risk; 47% low risk.
J - Approximately 18% high risk; 17% moderate risk; 65% low risk.
W - All of the Forest is at low risk.
D - Approximately 12% high risk; 10% moderate risk; 78% low risk.
L - All of the Forest is at low risk.

Wildlife and Plant Habitat

Capability of habitats to sustain wildlife populations or effects from management activities varies according to alternative. Distribution of snags and protection of Threatened and Endangered species also varies.

NC - Elk and deer habitat capability declines rapidly; mature and old-growth habitat is maintained in Wilderness; sensitive plant habitat impacted; potential loss of snag dependent species; T&E species protected at minimum levels.

K - Elk and deer habitat capability declines; old growth habitat maintained in Wilderness and habitat networks; sensitive plant habitat impacted; moderate amounts of habitat for snag dependent species; T&E species protected at minimum levels.

A - Elk and deer habitat capability declines in some areas, improves in others; old growth habitat maintained in Wilderness and habitat networks; sensitive plant habitat impacted; low amounts of habitat for snag dependent species; T&E species protected at minimum levels.

J - Elk and deer habitat capability increases; old growth habitat maintained in Wilderness and habitat nteworks; sensitive plant habitat moderately impacted; moderate amounts of habitat for snag dependent species; T&E species protected at minimum levels.

W - Elk and deer habitat capability increases; old growth habitat linked by corridors; sensitive plant habitat protected; moderate amounts of habitat for snag dependent species; T&E species and habitat protected.

D - Elk and deer habitat capability increases; quality and distribution of old growth habitat increases; sensitive plant habitat protected; high amounts of habitat for snag dependent species; T&E species and habitat protected.

L - Elk and deer habitat capability increases; old growth habitat at high levels Forest-wide; sensitive plant species rarely impacted; high amounts of habitat for snag dependent species; T&E habitats and species protected.

ECONOMIC COMPARISONS OF ALTERNATIVES

The economic implications of alternatives are displayed in Table S-3. Variations in costs, benefits, present net value, and cash flows among alternatives are described in this section. These economic indicators could not be reasonably estimated for Alternative NC (No Change) since it is based on a set of assumptions different than those of the other alternatives, and could not be modeled with the current Forest FORPLAN model.

Present net value (PNV) is a quantitative measure of economic efficiency, and thus is a key variable in the comparison of alternatives. It is defined as the difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area. "Discounting" is the procedure used to adjust all future costs and benefits to their present-day equivalent values in order to enable a meaningful comparison of dollar

flows through time. The discounted benefit and cost flows represent the potential net dollar returned for each alternative: the larger the PNV, the greater the potential return.

By providing a monetary, quantitative measure of economic efficiency, present net value is a very useful indicator of differences among alternatives in terms of their total output of public benefits. A full assessment of net public benefits, however, also requires a consideration of primary benefits and costs that have not been assigned a dollar value. Included in this category are outputs such as increased populations of some wildlife species, and physical conditions such as the maintenance of scenery. The value of such outputs and effects cannot be reasonably reflected in dollar terms because the data and/or methodology needed to do so are not available.

Another aspect of describing differences among alternatives and ultimately selecting a Preferred Alternative is the degree of issue resolution. Secondary benefits and costs, such as employment, are often important for understanding the degree of issue resolution.

Table S-3 displays the present net value, total discounted benefits, and total discounted costs for each alternative. Alternatives are ranked in order of decreasing present net value. Change in PNV between alternatives measures the net economic value of the priced outputs that would be forgone if an alternative with a lower PNV were selected.

Variations in present net value among alternatives are due to the wide range of possible costs and benefits represented in the alternatives. Each alternative is designed to produce a unique set of both priced and nonpriced outputs and effects, each of which generates a distinct pattern of values and costs.

Table S-3. Present Net Value, Discounted Benefits, and Discounted Costs[1]

Item	Alternative						
	NC[2]	K	A	J	W	D	L
PNV	NA	3,503	3,184	3,060	2,858	2,780	1,607
Discounted Benefits							
Timber	NA	5,465	5,123	4,520	4,131	4,010	1,281
Market Recreation Value	NA	6	5	6	7	6	6
Other	NA	1	1	1	1	1	1
Nonmarket Recreation	NA	1,403	1,234	1,329	1,346	1,421	1,354
Total	NA	6,875	6,363	5,856	5,485	5,438	2,642
Discounted Costs							
Recreation[3]	NA	(145)	(113)	(125)	(140)	(170)	(134)
Fish & Wildlife	NA	(141)	(130)	(103)	(96)	(110)	(79)
Range	NA	(1)	(1)	(1)	(1)	(1)	(1)
Timber[4]	NA	(438)	(421)	(384)	(350)	(356)	(130)
Water/Air/Soils	NA	(38)	(38)	(37)	(36)	(37)	(27)
Minerals/Geology	NA	(8)	(8)	(7)	(6)	(6)	(2)
Lands	NA	(11)	(11)	(11)	(11)	(11)	(11)
Facilities (Roads)	NA	(403)	(376)	(354)	(327)	(284)	(195)
Planning	NA	(2)	(2)	(1)	(1)	(1)	(1)
Protection	NA	(166)	(1,58)	(134)	(124)	(126)	(40)
Administration	NA	(132)	(125)	(108)	(99)	(98)	(33)
Purchaser's Costs	NA	(1,885)	(1,797)	(1,531)	(1,435)	(1,458)	(383)
Total		(3,370)	(3,179)	(2,796)	(2,626)	(2,658)	(1,036)

[1]Direct comparisons of benefits and costs in millions of 1982 dollars displayed for individual resource outputs provide general indications of relationships but may be misleading because many multiple-use outputs have common costs of production which cannot be reliably separated and attributed to individual resources. Alternatives displayed in order of decreasing present net value.

[2]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. The alternative NC Description under "Alternatives Considered in Detail," of Chapter II in the FEIS describes these differences.

[3]Costs are for the Wilderness and recreation programs.

[4]Includes all timber-related costs except roads.

The principal factors influencing the level of priced benefits, costs, and present net value on the Forest are the amount and timing of timber harvest. Since this activity has relatively large investment costs and dollar returns associated with it, the volume harvested is the primary determinant of the magnitude of the economic criteria in each alternative. The timing of harvest (i.e., the adherence to a nondeclining yield schedule) is also very important. A departure from nondeclining yield accelerates investments and returns, thereby increasing PNV.

Other priced outputs, such as semiprimitive recreation opportunities, anadromous fish production, and fish and wildlife use, cannot compete with timber harvest economically and would not be produced at levels that affect timber harvest volumes or schedules based solely on economic efficiency criteria. Objectives for these resources can only be achieved through the use of constraints, specific prescriptions, or land allocations. To the extent that these objectives reduce the available timber harvest land base or restrict harvest through longer rotations, limits in harvest unit sizes, or other means, a reduction in present net value can be expected.

Economic values associated with potential future production of locatable minerals, oil and gas, geothermal energy or hydroelectric power are not included in alternatives. The possibility of future development of mineral and energy resources on the Forest does exist. However, the timing of development and the magnitude of production are both highly speculative. It is possible that the economic value of these activities will vary by alternative if they are undertaken.

Comparison of total economic benefits to total costs measures the overall economic efficiency of each alternative. Another important consideration is the flow of dollars to and from the U.S. Treasury. In this comparison the important factors are receipts (the portion of total market output collected as fees or payments) and budget costs. The difference between the two is the net cash flow to or from the Treasury. Net cash flows for the 1st, 2nd, and 5th decades for each alternative are also displayed in Table S-3. The major differences among both economic values and cash receipts are due to different levels of timber production. Over 99% of the revenues received by the Forest are from the sale of timber.

The columns labelled "Noncash Benefits" in Table S-3 represent the total estimated dollar value of the nonmarket resources to which values have been assigned. They are presented to give the reader an idea of the relationship between the actual receipts generated by the alternatives and the value of the nonmarket outputs to which values have been assigned.

Differences in noncash benefits to users generally vary inversely with harvest levels because of the relationship between harvest and recreation-related outputs. Thus, within the range of alternatives, noncash benefits increase as net receipts decrease. Second and fifth decade noncash benefits reflect anticipated increases in recreation use which accounts for a general rise in benefits.

MAJOR TRADE-OFFS AMONG ALTERNATIVES

This section summarizes the relationships and trade-offs among alternatives in terms of the selected issues and economic criteria. The purpose is to highlight major economic and noneconomic trade-offs that can be quantified by using indicators of responsiveness to issues as a means of comparing alternatives. Table S-4 displays the results for each indicator by alternative.

The indicators that could be estimated for the No Change Alternative are displayed in Table S-4. Many indicators could not be reasonably estimated because Alternative NC (No Change) is based on a different set of assumptions than the other alternatives, and could not be modeled with the current FORPLAN model.

Most issue indicators follow consistent patterns throughout the range of alternatives. The primary relationship associated with most indicators is the level of timber harvest in an alternative. Levels of economic indicators (present net value, net cash flows, payments to counties, jobs, and income) and of firewood are positively correlated with the amount of timber harvest in an Alternative. The amount of lands allocated for roadless, semiprimitive, and scenic management, and the level of spotted owl habitat and old-growth remaining are complementary with each other and negatively correlated with the level of timber harvest. Higher levels of timber harvest generate higher levels of potential adverse watershed impacts and greater amounts of erosion.

Table S-4 displays the specific data for each issue indicator and alternative.

Table S-4. Tradeoffs of Economic Benefits and Indicators of Response to Issues

Issues	Max PNV Bench -mark	Units	NC	K	A	J	W	D	L
Economics									
PNV	3.8	$MMM	NA[3]	3.5	3.2	3.1	2.9	2.8	1.6
Cash Flows 1st decade		$MM/Yr	NA	66	62	54	52	42	6
5th decade		$MM/Yr	NA	88	79	86	72	52	6
Noncash Benefits 1st Decade	39	$MM/Yr	39	40	41	41	40	38	41
5th decade		$MM/Yr	NA	71	53	60	62	74	63
Payments to Counties	33	$MM/Yr	39	32	30	27	25	23	8
Changes in Income[1]	NE[2]	$MM/Yr	156	74	53	14	-6	-15	-173
Changes in Jobs[1]	NE[2]	Number	5653	2945	2218	900	204	-167	-5499
Timber									
ASQ[7]	660	MMBF	810	650	608	530	491	476	150
ASQ[7]	113	MMCF	146	117	110	95	87	86	27
Long-Term Sustained Yield	123	MMCF	146	120	114	108	95	94	34
Recreation									
Special Interest Areas	NE[2]	M Acres[4]	1.1	2.8	1.1	22.6	31.1	15.2	3.4
Trail Construction[7]	NE[2]	Miles	0	0	0	4.0	6.0	6.8	4.0
Semiprimitive Nonmotorized		M Acres[4]	75.3	14.4	72.2	89.5	85.8	176.5	102.0
Semiprimitive Motorized		M Acres[4]	23.9	48.3	23.4	31.3	36.0	38.2	66.3
Water									
Low Watershed Risk[6]	NE[2]	% Area	NA	41	47	65	100	78	100
Moderate Watershed Risk[6]	NE[2]	% Area	NA	27	25	17	0	10	0
High Watershed Risk[6]	NE[2]	% Area	NA	29	28	18	0	12	0
Erosion (Debris Slides)[7]	NE[2]	M C.Yds	NA	85.6	80.3	67.0	28.5	33.4	23.9
Wildlife									
Spotted Owl Habitat	59	# Areas[4]	0	59	59	59	59	102	184
Elk Population	NE[2]	M Elk[6]	NA[3]	3.7	4.2	4.5	4.8	5.6	5.6
Deer Population	NE[2]	M Deer[6]	NA[3]	17.8	19.5	23.1	24.9	28.4	26.6
Scenic Quality									
Retention		M Acres[4]	88.6	72.0	77.9	90.5	118.8	142.1	265.1
Partial Retention		M Acres[4]	114.3	147.5	150.1	177.7	171.7	246.7	286.3
Modification		M Acres[4]	4.5	123.6	4.5	206.2	143.0	108.4	4.5
Old Growth									
Acres Remaining After 10 Years		M Acres	494.0	522.4	528.4	534.9	533.4	537.2	578.3
Roadless									
Area Allocated to Roadless	0	M Acres[4]	45.4	25.3	59.8	79.7	92.1	136.9	145.9

[1]Changes represent the total potential change in the 1st decade as compared to historical averages over the life of the current Forest Plan (1977-1985).
[2]NE = Not estimated, benchmarks were not analyzed as fully developed implementable alternatives.
[3]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Forest FORPLAN model. See alternative Considered in Detail, Chapter II for additional information.
[4]Represents lands allocated to meet this objective.
[6]Percent of total Forest area at the end of the 1st decade in this watershed risk category. See Chapter IV, Water for further explanation.
[6]Represents end of 1st decade conditions.
[7]Units are average annual for 1st decade.

ENVIRONMENTAL CONSEQUENCES

THE RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Long-term productivity gains through use of various management practices on the Forest are of several types. Practices such as the replacement of old slower-growing timber types with younger, productive stands, the use of commercial tree thinning, and the use of prescribed fire to improve wildlife habitat have measurable long-term economic gains.

Wood fiber production will be increased over the long run as some of the old-growth stands are harvested and converted to more productive second growth stands. Opportunities for dispersed recreation use, including hiking, camping, fishing, hunting, snowmobiling, sightseeing, and cross-country skiing will be maintained and increased for future generations.

While some forest practices can cause losses such as temporary increases in soil erosion and temporary displacement of certain wildlife species, on the whole the ecosystem remains in balance with productivity gains exceeding losses in the long-term. For example, timber management activities such as clearcutting and prescribed burning alter the natural appearing landscape and have a short-term adverse impact on the scenic values. These impacts are reduced within several years with vegetative recovery and are mitigated in the long-term by integrating the principles of landscape management into all Forest management practices and activities.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irreversible commitment of resources results from a decision to use or modify resources that are renewable only over a long period of time, such as soil, or nonrenewable resources such as cultural resources or minerals. The proposed Forest Plan and the alternatives examined are based on the principles of multiple-use and long-term productivity for all resources. Measures to protect natural resources that could be irreversibly affected by management practices are incorporated into Forest-wide standards and guidelines.

Removal of mineral or energy resources is an irreversible commitment of resources. The removal and utilization of rock resources for road construction would be an example of a common use on the Forest.

Soil erosion, as a result of management activities, is an irreversible loss; once the soil particles are removed from the site and deposited into a stream or river, they are no longer available.

An irretrievable commitment of resources is a use of resources that are lost because of land management objectives. This represents opportunities foregone for the time that the resource cannot be used. An example of an irretrievable commitment might be the loss of wildlife habitat where the management objective for an area is developed recreation.

The development of roadless areas would mean an irretrievable loss of the characteristics which qualify these areas for Wilderness designation. On the other hand, not developing roadless areas is an irretrievable loss of opportunities for vegetation management. This could result in lower volumes of timber harvest and forage being produced on the Forest.

Irretrievable loss of timber production could result from stands being designated as old-growth wildlife habitat, reserved for cultural resource protection, or dedicated for other uses such as arterial and collector roads, administrative sites, and developed recreation sites. Insects, diseases and fire can also cause irretrievable losses to vegetation.

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Under any alternative, some adverse impacts to the environment could be expected to occur which cannot be completely mitigated. However, the application of the management prescription standards and guidelines is intended to limit the extent and duration of these effects. Given the limited supply of an undisturbed Forest setting, extensive Forest use will diminish opportunities for a sense of remoteness, naturalness, and solitude in the Forest. Adverse effects of timber harvest, road construction, increased dispersed recreation use and the development of recreation sites include impacts such as disturbance to vegetation, compaction of soil, impacts on water quality, increases in noise levels, and disturbance of game animals and their habitat.

Fire hazard and resistance to control will increase subsequent to logging and thinning operations as a result of increased timber residues. Fire risk also increases as a result of more people using an area during and after management activities.

Air quality will diminish on a local and temporary basis due to prescribed burning.

In unroaded areas, development activities such as timber harvesting and road construction associated with harvest, recreation, or other purposes will have an adverse effect on the potential future management of these areas as designated Wilderness, as Research Natural Areas, or for other purposes requiring natural characteristics.

The disturbance or displacement of fish and wildlife may occur as a consequence of increased human activity on project areas.

The disturbance or destruction of some artifacts and sites is liable to occur as a result of some management activities. This would be especially true for subsurface sites that cannot be located through surface surveys.

SIGNIFICANT CUMULATIVE EFFECTS

The majority of watershed research conducted on the Forest indicates that when the percentage of a watershed in immature timber stands increases beyond 25% to 30%, changes may occur in the quality, quantity and timing of runoff. The ability of a drainage to absorb impacts is determined by a wide range of variables including soils, vegetation, slope, stability, aspect, past and present management including timber harvest, road construction, and use.

A cumulative effect of disturbing artifacts and sites is the loss of information about the prehistory and history of an area. This inhibits the efforts of historians and anthropologists to describe accurately the cultural history of the Forest and its relationship to other parts of the region. As a result, cultural sites and artifacts on Forest land may become more important over time.

As natural settings are altered through timber harvest and road construction, the capacity of the Forest to provide some types of dispersed recreational settings and experiences is diminished. The greater the

shift from unroaded recreation to roaded recreation in the alternatives, the greater the cumulative effect on semiprimitive (motorized and nonmotorized) recreation opportunity settings.
As road construction and timber harvest activities are implemented over several decades, they have the potential to affect an increasing amount of trail mileage.

While a single activity may only affect its immediate surroundings, many activities over several years or decades will diminish the scenic quality of a much larger area. This effect has even greater consequence in areas where private or other public agency land is adjacent to the Forest. Areas with large blocks of intermingled ownership may display these effects most significantly. It is assumed that private landowners having a large timber inventory will harvest timber and will not keep the landscape in a natural appearing condition. This "checkerboard" effect will be most apparent in the North Santiam, South Santiam, and Middle Fork of the Willamette drainages and to a lesser extent in the McKenzie drainage and around the community of Oakridge.

Approximately 22% of the Forest is currently designated Wilderness. This has the effect of natural state preservation of the water, vegetation, soil, and air quality. The nondesignation of suitable lands may result in the development of such land and over time these may become unsuitable for future Wilderness consideration. Another effect on Wilderness is the development, such as timber harvest and road construction, that may occur adjacent to Wilderness boundaries. This effect may result in physical changes that over a period of time can influence the Wilderness opportunity to be provided. Improved access could result in a greater number of visitors entering the Wilderness at more locations, adversely affecting the type of recreation experience currently provided. Each alternative proposes different levels of development for different amounts of the inventoried roadless areas. As roads are constructed and timber sale units are harvested, roadless areas will be altered in size and shape. In addition, roadless areas adjacent to other allocations and landownerships are subject to the external influences of their management. These effects will alter the potential of individual areas to provide Wilderness quality experiences and opportunities in the future.

As natural settings are altered through timber harvest and road construction, the capacity of the Forest to provide some types of Special Interest Area, National Natural Landmark, and Research Natural Area settings is diminished. Changes to vegetation patterns, surface drainage, and soil horizons on land adjacent to established Special Interest Areas, National Natural Landmarks, and Research Natural Areas may over a period of time affect the natural processes of individual areas or result in an eventual loss of research potential.

In general, alternatives which harvest more acres of timber will gradually result in younger age classes, fewer stands of old-growth, and a younger average age of timber stands in the Forest. Along with the younger ages will come smaller average tree sizes. There will be less defect and breakage as diseases and deformities found in mature and overmature tree have less chance to develop in the younger stands. As more stands are harvested and managed for timber production, there will be a gradual decrease in the population of the more shade tolerant climax species, such as western hemlock and Pacific silver fir. Laminated and blackstain root rots may show some increase with intensive management but losses can be minimized by planting and favoring resistant species and timing precommercial thinning to minimize spread of disease by insects seeking out the fresh cut stumps.

The per acre yield of commercial products from the Forest will increase as stands are managed to maintain fast growth rates by controlling competition. Growth will also be enhanced through fertilization, (except in Alternative NC), and genetic selection. Cross-breeding for desirable genetic traits will provide greater increases in successive generations. Care must be taken to avoid reducing genetic diversity which could make the Forest increasingly susceptible to insects and disease. All alternatives meet or

exceed the requirement that the growth rate by the year 2030 be 90% of long-term sustained yield capacity.

ORGANIZATION OF THE DOCUMENTS

The complete set of Willamette National Forest planning documents includes: (1) Final Environmental Impact Statement (FEIS), (2) Appendices to the FEIS, (3) Forest Plan, (4) FEIS Summary, (5) Resource and Alternative Maps, and (6) Record of Decision.

This document organization guide is provided to assist the reader in understanding what information is presented in each of the planning documents. A thorough reading of the FEIS will aid in understanding the implications of the Proposed Action, which is the basis for the Forest Plan.

In addition to the material included in the FEIS, Forest Plan, and supporting Appendices, other information and records are available during regular business hours at the Willamette National Forest Supervisor's Office; 211 East Seventh Avenue; Post Office Box 10607; Eugene, Oregon 97440.

Final Environmental Impact Statement

Chapter I: "Purpose and Need" identifies the laws and regulations which direct the planning process. Chapter I identifies the public issues and management concerns about the land and resource management of the Willamette National Forest.

Chapter II: "Alternatives Including the Proposed Action" presents the seven alternatives selected for analysis, explains their formulation, indicates response of the alternatives to the issues, and provides a basis for choice among the range of alternatives. The alternatives are compared on the basis of their outputs of goods and services in response to the issues. The alternatives selected for display in the FEIS are Alternatives NC (No Change), A, D, J, K, L, and W (Preferred Alternative).

Chapter III: "Affected Environment" describes the environment of the area to be affected by the range of alternatives under consideration. Information includes the physical and biological setting, the social and economic setting, and the current situation of specific Forest resources.

Chapter IV: "Environmental Consequences" discusses the environmental impacts of the Alternatives, any adverse environmental effects which cannot be avoided should the preferred alternative be implemented, the relationship between short-term human uses of the environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the preferred alternative should it be implemented.

Other Sections of The FEIS

List of Preparers: Identifies the Interdisciplinary Team Members and provides a brief description of their roles, education, and experience.

List of Agencies and Organizations to whom copies of Forest planning documents have been sent.

References: The list of the works referred to in the FEIS.

Glossary: Terms, their definitions and abbreviations.

Index: Provides the page locations of topics discussed within the planning documents.

Appendices to the FEIS

The Appendices present the more technical or detailed information involved in the planning process.

Appendix A presents a chronology of public involvement activities which were used to determine the issues to be addressed. It includes background on issue development, a listing of the various publics contacted and/or consulted, and the issues selected to be addressed in the FEIS.

Appendix B describes the analysis process used in developing the alternatives. It details the quantitative methods used to perform the analysis.

Appendix C provides a description of each of the inventoried roadless areas on the Forest.

Appendix D contains information about the standards and guidelines, and the management area prescriptions which do not apply to the preferred alternative, but which may apply to other alternatives. The M.A. Prescriptions which apply to the preferred alternative are in Chapter IV of the Forest Plan.

Appendix E describes the analysis and study of rivers on the Forest that are designated, under study, or eligible for inclusion in the Wild and Scenic Rivers System.

Appendix F describes the rationale used to determine the appropriate harvest systems implemented in managing coniferous forest stands on the Forest during the next 10 years on those lands where timber production is prescribed.

Appendix G describes the analysis used and considerations in determining how management requirements for soil, water quality and wildlife habitat could be met and the potential effects on various resources.

Appendix H outlines the Best Management Practices that would be used in any of the alternatives to meet water quality objectives.

Appendix I presents a summary of the comments received on the DEIS and Proposed Forest Plan including Forest responses to the substantive comments.

Forest Plan

The Forest Plan contains management direction for the Forest land and resources based on the Preferred Alternative identified in the FEIS. It contains the detailed standards and guidelines for management practices.

Summary of the FEIS

The **Summary** is a brief overview of the material contained in the FEIS.

Map Packet

The **Map Packet** contains the alternative maps which display the allocations of management areas by alternative. It also contains a separate planimetric map of the Preferred Alternative at a 1/2 inch to 1 mile scale displaying management area boundaries and locations.

Record of Decision

The Record of Decision clarifies what decisions are being made and the rationale behind them.

CHAPTER I

PURPOSE AND NEED

INTRODUCTION

National Forest Land and Resource Management Planning is a process for developing, adopting, and revising land and resource management plans for the National Forest System as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA). The resulting Land and Resource Management Plans (Forest Plans) provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits in an environmentally sound manner. The National Forest System Land and Resource Management Planning process is described in Title 36, Part 219 of the Code of Federal Regulations.

The purpose of this Final Environmental Impact Statement (FEIS) is to provide decisionmakers with an environmental disclosure sufficiently detailed to aid in the selection of a Forest Plan, which contains new management direction for the Forest. Equally important, its purpose is to make information available to the public, and to encourage public participation regarding the development and refinement of that direction. This document discloses the planning process and analysis of the significant environmental effects of a proposed action and 6 other alternatives for the future management of land and resources of the Forest.

Each alternative in the DEIS addresses local, regional, and national public issues, management concerns and opportunities (ICOs); provides for use and protection of resources; and fulfills legislative requirements. Every alternative generates a different mix of goods and services from the Forest. In the analysis, outputs and effects are projected for five decades to indicate long-term implications.

The Preferred Alternative is the "proposed action" (40 CFR 1502.14) which provides for a level of multiple-use and sustained yield of goods and services that is judged to best maximize long-term net public benefits in an environmentally sound manner while responding effectively to all the public issues. Net public benefits represents the cumulative net value of all Forest outputs and activities, whether assigned a dollar value or not.

The Preferred Alternative, as modified by the Record of Decision, is the basis for the accompanying "Willamette National Forest Land and Resource Management Plan" which is a separate document. The purpose of the Forest Plan is to direct all natural resource management activities on the Forest. The Forest Service is required to revise the plan within 15 years of its adoption and this revision may establish different long-term goals with different projected effects and outputs. The Forest Plan may also be amended any time during the next 10 to 15 years if changed conditions or monitoring results indicate adjustments are needed.

While the Forest Plan will guide the management of the Forest for the next 10 to 15 years, the analysis in the FEIS covers a planning horizon of 50 years to evaluate and display the long-term effects of actions during the planning period. This evaluation has two purposes. First, it presents a long-term analysis for decisionmakers and the public of the management necessary for each alternative to achieve and maintain the optimum level of regular periodic outputs of various resources. Secondly, the long-term

analysis allows net public benefits to be maximized while responding effectively to all the public issues without impairment to the productivity of the land (16 U.S.C. 531). The analysis also provides an estimate of the level of long-term outputs for each alternative based on an unconstrained budget and maximization of net public benefits, subject to responding effectively to the public issues.

Preparation of an Environmental Impact Statement is required because the Forest Plan is a major federal action which may have a significant effect on the quality of the human environment. Its development follows the direction of the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality (CEQ) NEPA Regulations (40 CFR 1500-1508). For purposes of disclosure under NEPA, this DEIS and the accompanying Proposed Forest Plan are treated as combined documents.

A list of references cited in the FEIS and a glossary defining terms, units and abbreviations are located at the back of this document. The reader will find it useful to consult the land management allocation maps for each alternative when reviewing this FEIS. The maps are in a separate packet accompanying this document. A complete description of the direction and emphasis for each of the management areas displayed on the maps is in Chapter II, Comparison of Alternatives.

Disposition Of Previous Plans

The Final Forest Plan will incorporate or replace previous land management and resource management plans prepared for the Forest.

The following plans will be replaced by the Forest Plan:

- Multiple Use Land Management/Timber Management Plan (1977)
- Mt. Jefferson Wilderness Management Plan (1977)
- Three Sisters Wilderness Management Plan (1974)
- Lava Fire Management Plan (1978)
- Trail Management Plan (1980)
- Waldo Lake Recreation Area Plan (1962)
- Off-Road Vehicle Plan (1974)

The following plans will be incorporated as part of the Forest Plan:

- Land Ownership Adjustment Plan (1974)
- Lamb Butte Special Interest Area Plan
- Research Natural Area Establishment Reports

Ollalie Ridge (1963)
Gold Lake Bog (1965)
Wildcat Mountain (1968)
Middle Santiam (1979)

- Geothermal Development Plans

  Breitenbush Area FEIS (1978)
  Belknap-Foley FEIS (1981)

- Willamette Pass Alpine Winter Sports FEIS (1985)

- Crale Creek Bald Eagle Management Plan (1982)

- Hills Creek Reservoir Bald Eagle Management Plan (1983)

Upon implementation, Forest management activities will comply with the Forest Plan. Appropriated budgets may alter the schedule of activities. In addition, all permits, contracts, and other instruments for the use and occupancy of National Forest System lands and resource uses must be in conformance with the Forest Plan as soon as possible (36 CFR 219.10(e)).

Changes Between Draft And Final

The Draft Environmental Impact Statement (DEIS) and Draft Forest Plan were released to the public in December 1987. Changes that have occurred since the DEIS are incorporated in this FEIS. Many of these changes are in response to public comments on the DEIS and Draft Forest Plan. Included are revisions and updates to data and technical modeling procedures used in the analysis, as well as modifying alternatives presented in the DEIS and the development and analysis of additional alternatives. A complete listing of the analytical and technical changes can be found immediately follow the introduction to Chapter II of this document.

The final Supplement to the EIS (SEIS) for an Amendment to the Pacific Northwest Regional Guide (USDA Forest Service 1988) was issued in July 1988 and provides Regional guidelines for maintaining viable populations of northern spotted owls. The new management direction was incorporated in the FEIS resulting in changes in the habitat network and standards and guidelines.

The Oregon Omnibus Wild and Scenic Rivers Act of 1988 designated approximately 12.7 miles of the McKenzie River and 42.3 miles of the North Fork of the Middle Fork of the Willamette River as Wild, Scenic and Recreation rivers. The South Fork of the McKenzie River and Blue River were specified as Study Rivers in the Act also.

The Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation (USDA Forest Service 1988) was released since the DEIS. Changes were made to standards and guidelines to be consistent with the guidelines presented in the FEIS and to reflect a reduced emphasis on herbicide use.

All of the changes mentioned above are discussed in greater detail in Chapter II, Changes Between Draft and Final and Description of Alternatives.

Changes specific to Chapter I, Purpose and Need, primarily involve additional information and clarification of the 7 key issues that were identified through initial scoping efforts and displayed in the DEIS. Public comments on the DEIS and Draft Forest Plan are the principal source of these changes. Although the number of comments received were voluminous (over 170,000 comments in 17,000 individual replies), almost of all of them were related to the original issues. While many simply restated earlier input from the scoping process, others helped to clarify specific points or identify new aspects within the broader issues that were not recognized during the scoping phase or have developed in the 4 to 5 years between scoping and the DEIS release. Public response also served as an indicator of the intensity of the individual issues and how this may have changed during the planning process.

In response to the comments, all of the key issues were reviewed to determine if they were current and accurately portrayed concerns raised in public comments in the FEIS. Where necessary, the ICOs have been updated to keep them current and within the scope of the planning process. In addition to the discussion of ICOs in this section of the document, further information is available in Appendix A, *Issues, Concerns and Opportunities* about specific changes and refinements in ICOs between the DEIS and FEIS.

PLANNING PROCESS

To put forest planning in perspective, it is important to have a general understanding of the overall Forest Service planning process. As required by RPA, NFMA, and the related implementing regulations cited above, the Forest Service has a three-level, integrated planning process.

At the national level, the RPA Program establishes long range resource objectives based on the present and anticipated supply of, and demand for, various resources. A portion of each national resource objective included in the RPA Program is distributed to each of the nine Forest Service Regions in the nation.

At the regional level, a Regional Guide is developed. The Regional Guide presents the distribution of its portion of the national objectives to each National Forest. In addition, the Regional Guide establishes Regional management standards and guidelines. The *Regional Guide for the Pacific Northwest Region* of May 1984 provides this direction for the Forest.

At the National Forest level, a Forest Plan is proposed from the analysis of a set of alternatives that reflect a range of resource objectives, outputs, and effects. One or more of these alternatives are developed to meet or exceed the current RPA Program objectives displayed in the Regional Guide. The alternative development process is described in Chapter II.

The RPA Program is submitted to Congress as an aid to determine appropriation and authorization of the agency's annual budget. Since allocations in the annual budget have a major effect on management activities, many of the Forest's actual outputs and environmental effects are ultimately determined in large part by the annual budget. Through implementation of the Forest Plan and annual budget commitments, the planning process is responsive to public issues and resource capabilities of the Forests.

The planning process is a cyclic process. The information from the Forest level flows up to the national level, is incorporated in the RPA Program, then flows back to the Forest level. In this way, the information regarding resource capabilities and demands is incorporated into the RPA Program.

The planning process specified in the NFMA implementing regulations and the environmental analysis process specified in the CEQ regulations were used in developing this FEIS and the accompanying Proposed Forest Plan. The planning steps employed are:

Identification Of Purpose And Need

This first step is focused on the identification and evaluation of public issues, management concerns and resource use and development opportunities. It is the phase in the process where the major issues, concerns, and opportunities to be addressed in the planning process are determined.

Preparation Of Planning Criteria

Criteria are prepared to guide: collection and use of inventory data and information; analysis of the management situation; and the design, formulation, and evaluation of alternatives. Specific criteria are derived from laws, executive orders, regulations, and agency policies; goals and objectives of the RPA Program and the Pacific Northwest Regional Guide; plans and programs of other agencies; ecological, economic, and technical factors; and resource integration and management requirements specified in the NFMA Regulations.

Inventory Data And Information Collection

Current information and inventory data, including maps and graphic material, appropriate for planning and managing forest resources are collected and maintained. This may require special inventories or studies to be prepared to address emerging issues or changes in planning direction.

Analysis Of The Management Situation

The analysis of the management situation is a determination of the ability of the planning area covered by the Forest Plan to supply goods and services in response to society's demands. The purpose of this analysis is to provide a basis for formulating a broad range of reasonable alternatives and includes benchmark assessments to define resource capability ranges within which alternatives can be constructed.

Formulation Of Alternatives

Alternatives are formulated, in accordance with NEPA procedures, that reflect a broad range of resource outputs and effects and are responsive to public issues and management concerns.

Estimated Effects Of Alternatives

The physical, biological, economic, and social effects of implementing each alternative that is considered in detail are estimated and compared. The purpose of this step is to estimate objectively what the effects would be, given implementation of any one of the alternatives considered in detail.

Evaluation Of Alternatives

The evaluation includes an analysis of the aggregate physical, biological, economic, and social effects of the management alternatives and provides a comparative assessment of present net value, social and economic impacts, outputs of goods and services and overall protection and enhancement of environmental resources.

Recommendation Of A Preferred Alternative

The Draft Environmental Impact Statement (DEIS), which identifies the Preferred Alternative, and the Draft Forest Plan, are prepared for public review. This DEIS and the draft Forest Plan are circulated for review and comment, ensuring that environmental information is available to public officials and citizens before decisions are made and before actions are taken. A Final Environmental Impact Statement (FEIS) is prepared and the Preferred Alternative is identified after comments from DEIS are reviewed and evaluated.

Plan Approval And Implementation

The Regional Forester reviews the FEIS and Forest Plan. Upon completion of this review, the Regional Forester makes a decision regarding approval of the proposed Forest Plan. The decision is documented in a Record of Decision (ROD) and is made available to the public, as are the FEIS and Forest Plan.

Upon implementation, the FEIS and Forest Plan will be used for "tiering" in accordance with the CEQ regulations. Tiering means that site-specific environmental analysis conducted for projects arising from the Forest Plan will refer to the FEIS and associated documents rather than repeat information

from those documents. In this way, the environmental documents prepared for a site-specific project will need only to concentrate on issues unique to that project (40 CFR 1508.28).

Monitoring And Evaluating

At intervals established in the Plan, implementation shall be evaluated on a sample basis to determine how well objectives have been met and how closely management standards and guidelines have been applied. Based on this evaluation, revisions or amendments to the Forest Plan may be recommended.

The Forest Plan will ordinarily be revised on a 10-year cycle or at least every 15 years. It also may be revised whenever the Forest Supervisor determines that conditions or demands in the area covered by the plan have changed significantly or when changes in the RPA policies, goals, or objectives would have a significant effect on Forest level programs. In the monitoring and evaluation phase, the interdisciplinary team may recommend a revision of the Forest Plan at any time. Revisions are not effective until considered and approved in accordance with the requirements for the development and approval of the Forest Plan. The Forest Supervisor will review the conditions on the land covered by the Plan at least every five years to determine whether conditions or demands of the public have changed significantly (36 CFR 219.10(g)).

In addition to revisions, the Forest Plan may also be amended (36 CFR 219.10). A Forest Plan amendment may be significant or nonsignificant depending on the scope of adjustment or change that is considered and only changes a specific aspect of the Forest Plan in contrast to a plan revision which revisits the entire set of resource issues and land allocations. Amendments are expected to occur frequently during the life of the plan as monitoring, site-specific analyses or inventory updates indicate specific areas of the Forest Plan that need to be updated or adjusted to reflect current situations. Amendments of limited scope and effects may be done by the Forest Supervisor with a Decision Memo or a Decision Notice.

Additional information and file documents used in the Forest planning process to develop this FEIS and the accompanying Forest Plan are contained in the planning records maintained at the Forest Supervisor's Office, 211 East Seventh Avenue, Eugene, Oregon; they are available during regular business hours.

FOREST OVERVIEW

The Forest is an administrative unit of the Pacific Northwest Region of the Forest Service, U.S. Department of Agriculture, and is located within the Second, Fourth, and Fifth United States Congressional Districts. It lies primarily in Lane, Linn, and Marion Counties, but also extends south into Douglas County, east into Jefferson County, and north into Clackamas County. Figure I-C-1 displays a breakdown of the Forest acreage by county. The Forest headquarters is the Supervisor's Office located in Eugene, Oregon. There are seven Ranger Districts, with offices in Oakridge, Westfir, Lowell, Blue River, McKenzie Bridge, Sweet Home and Detroit. The vicinity map, Figure I-C-2, shows their location, the location of the Forest in Oregon and its relative size.

The Forest stretches for 110 miles along the western slope of Oregon's Cascade Mountains. The western edge of the Forest borders the Willamette Valley from the Mt. Jefferson area east of Salem to the Calapooya Mountains northeast of Roseburg. The crest of the Cascade Range defines the eastern boundary of the Forest.

There are over 1.7 million acres within the Forest boundary--1,675,408 of National Forest land and 123,330 acres of land in private ownership or managed by other public agencies. Over 380,000 acres of land within the Forest have been set aside by Congress to preserve Wilderness character and to conserve portions of the Forest's natural scenery, flora, and fauna. Other dedicated areas include the H.J. Andrews Experimental Forest, the Oregon Cascades Recreation Area, the Lamb Butte Scenic Special Interest Area, and four Research Natural Areas.

The landscape of the Forest is divided into two geological provinces, the Western Cascades and the High Cascades. The steep, deeply dissected valleys of the Western Cascades are geologically older than the High Cascades. Elevations range from 900 feet along the Santiam River to over 10,000 feet at the summits of Mt. Jefferson and the Three Sisters. Most of the Forest lies within an elevation range of 2,000 to 4,000 feet. Broad plateaus, broken by a line of inactive volcanoes along the crest, are characteristic of the High Cascades, which comprise one-third of the Forest. Alpine glaciation has left this terrain marked with U-shaped valleys, moraines, and glacial lakes.

Two-thirds of the Forest lies within the Western Cascades and contains some of the most productive forest land in the United States. Diverse forest vegetation provides habitat for a wide spectrum of wildlife. Nearly 300 vertebrate wildlife species inhabit the Forest, including both game and nongame species.

The Forest has approximately 400 lakes and more than 2,700 miles of perennial streams and rivers. An anadromous fishery, including salmon and steelhead, is found in the Forest's main tributaries. Surface water feeds seven major reservoirs that provide flood control, power generation, streamflow regulation, and recreation. Water for domestic use for rural communities and nearly 205,000 metropolitan users in the Willamette Valley also comes from the Forest's system. The main stream systems of the Forest are the Willamette, McKenzie, and Santiam rivers and their tributaries.

A variety of natural resource related products and services are produced on the Forest. Wood, water, wildlife, and recreation are the primary categories of these. Mild climate and abundant rainfall are extremely favorable to growing magnificent evergreen trees including Douglas-fir, western hemlock, and western red cedar. This Forest is the top timber producer of the 156 National Forests in the United States. The Forest produces about 8% of all timber cut on National Forest lands and provides an average of 750 million board feet of timber to the Nation's economy annually.

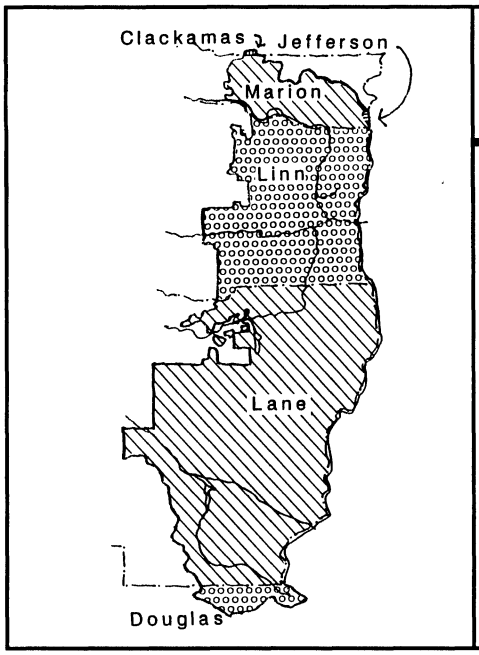
The amenity and commodity resources of the Forest are important nationally, as well as to the people of Oregon. The lumber and wood products industry is the State's number one manufacturing industry, with agriculture and tourism also playing a significant part in the economy of the State. Most of the timber sold by the Forest is processed in counties adjacent to the Forest. Over 25% of Oregon's population lives in urbanized communities located in Lane, Linn, Marion, Benton, and Polk counties, and a majority of this Forest's recreation users comes from these areas.

During all seasons of the year and at all elevations, the Forest environment provides for a variety of recreational experiences, including sightseeing, hiking, camping, boating, hunting, fishing, mountain climbing, downhill and cross country skiing.

Principal highways providing access to the Forest are State highways 22, 58, and 126, and U.S. Highway 20, all east-west routes. The Forest is within a 1 1/2-hour drive from Portland, and a 1-hour drive from Salem, Albany, Corvallis, Bend, and Eugene-Springfield.

A detailed description of the Forest is presented in Chapter III, "Affected Environment."

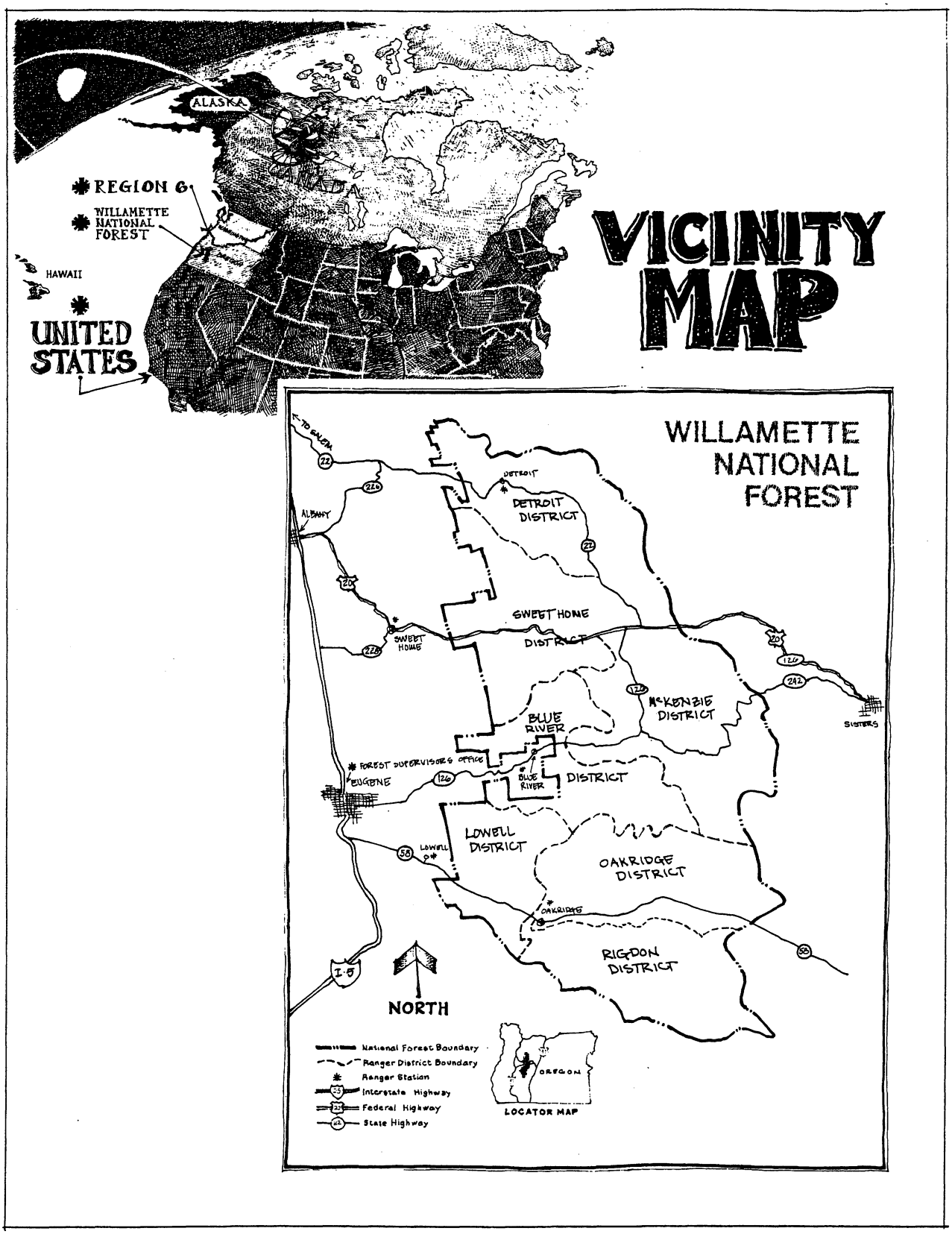
Table T311. Acreage By County (I-C-1)



County	WNF Acres In County	% Of WNF By County	Non-National Forest Acres	Acres Within Forest Boundary
Lane	1,021,941	34.8%	59,233	1,081,174
Linn	465,613	31.7%	56,013	521,626
Marion	136,064	18.1%	8,084	144,148
Douglas	50,296	1.6%	0	50,296
Clackamas	853	0.07%	0	853
Jefferson	640	0.06%	0	640
TOTAL	1,675,407		123,330	1,798,737

Source: Data base LYR06D (Administrative Boundaries).

Figure I-C-2


ALASKA
CANADA
REGION 6
WILLAMETTE NATIONAL FOREST
HAWAII
UNITED STATES
VICINITY MAP
WILLAMETTE NATIONAL FOREST
TO SALEM
ALBANY
DETROIT
DETROIT DISTRICT
SWEET HOME
SWEET HOME DISTRICT
BLUE RIVER
McKENZIE DISTRICT
SISTERS
FOREST SUPERVISOR'S OFFICE
EUGENE
BLUE RIVER DISTRICT
LOWELL
LOWELL DISTRICT
OAKRIDGE DISTRICT
OAKRIDGE
RIGDON DISTRICT
I-5
NORTH
National Forest Boundary
Ranger District Boundary
Ranger Station
Interstate Highway
Federal Highway
State Highway
OREGON
LOCATOR MAP

ISSUES, CONCERNS, AND OPPORTUNITIES

Introduction

The Forest is composed of complex natural ecosystems that can be managed for various combinations of goods and services, land uses, and environmental conditions. Many of these Forest resources, uses, and conditions are interrelated. Different people and groups prefer to see the Forest managed in different ways. Managing the Forest to emphasize some resources may cause changes in others, and tradeoffs are often necessary. There are practical and natural limits to what the Forest can provide without adversely impacting the quality of the environment.

A central task in Forest Planning is the analysis of a range of alternative ways of managing the National Forest. Alternatives are developed which meet legal requirements, and which address and are based on the important public issues and management concerns. Alternatives represent a blend of different resource emphases and combinations of management practices to produce the goods, services, and environmental conditions that people want. The planning analysis considers both the uses of the Forest, and the implications of these uses in ecological and human terms.

The Forest Planning process is guided by the public issues and management concerns which reflect the different preferences of individuals and groups, and the physical, biological, and legal limits on forest management. A public issue is a subject or question of widespread public interest relating to management of the National Forest System. A management concern is an issue, problem, or a condition which affects the range of management practices identified by the Forest Service in the planning process.

Issue Identification

The identification of public issues and the development of planning questions for the current planning effort began in the fall of 1979. An initial draft of existing and/or anticipated issues, concerns, and opportunities was circulated on-Forest to Rangers, Staff and Zone Engineers for review and comment. These issues and concerns were expressed as objectives and a hierarchy from general to specific was developed for the objectives. Facets of the issues were described from the specific statements in the objectives hierarchy. Following this, a response packet was prepared to solicit public comments. These packets were distributed at Forest offices and public meetings and mailed to concerned citizens and industry groups.

Open house sessions were held to explain opportunities for the public to participate in the Willamette's planning process. The sessions were informal and offered assistance in preparing response forms and answering questions. Response forms were returned by January 1981. There were 291 forms returned. An additional 41 items of correspondence were submitted; these were included in the analysis process as documented in the Planning Record.

Development of the final list of issues for Regional Forester submission and approval was the result of an in-depth analysis of the public responses received in early 1981. The final phase of the analysis had, as its central theme, the goal of validation/revision of the objectives hierarchy in terms of suggested revisions, additions, or comments contained in the public responses. The Regional Forester approved the list of issues in May 1981, and they have been used to guide the Willamette's planning process.

The issues are Dispersed Recreation, Developed Recreation, Wilderness, Visual/Scenic, Cultural Resources (Artifacts and Sites), Wildlife and Plant Habitat, Aquatic Habitat (Fish), Livestock Grazing (Range),

Current and Future Timber Production, Logging Residue (Firewood), Water Quality and Quantity, Air Quality, Minerals, Energy, Individual Well-being, Local Economies, Old Growth, Roadless Lands, Economic Efficiency. The effects of the alternatives on these issues are addressed in Chapter IV.

While all of the issues have been considered during the alternative development and analysis, there are seven major issue areas which have evolved as having the most importance in the selection of the preferred alternative. These major issues are those which have caused the greatest amount of comment in public meetings held by the Forest (see Figure I-D-1), meetings with small groups and individuals, and correspondence received.

The seven most significant public issues are:

1. Dispersed Recreation
2. Old Growth
3. Roadless Lands
4. Scenic Quality
5. Timber Supply
6. Water
7. Wildlife, Fish, and Plant Habitat

The issue identification process is discussed in more detail in Appendix A.

Discussion Of Selected Issues

Most Forest management issues are interrelated. There is information about the issues throughout this document. As you read, look for the key symbols that are associated with each issue subject area. These key symbols identify the important issue related discussions which describe interrelationships with other resource issues, effects, and the resolution of conflicts. Effective resolution of the issues is a goal of the Forest Plan. The lack of compatibility among the resource uses at all levels of output affects the degree of resolution possible for any one issue since it is necessary to find an approach that is responsive to all issues. Therefore some tradeoffs are necessary in each of the issues.

Dispersed Recreation

Overview - The Forest provides a wide range of outdoor recreation opportunities. The Forest provides several developed recreation sites (campgrounds, ski areas, boat launch ramps, etc.), but the primary recreation emphasis for the Forest Service is to manage for dispersed opportunities. "Dispersed recreation" is a term used to encompass all the outdoor recreation activities that occur on the Forest outside of developed sites, such as sightseeing, hiking, fishing and hunting, backcountry camping, and cross-country skiing.

The alternatives analyzed in this FEIS have the potential to affect dispersed recreational settings more than developed sites. Greater public concern has been expressed by users, recreation interests, timber industry, and environmental groups about the effects of management on dispersed recreation than developed, although the total amount of recreational visits (nearly 3 million RVDs per year) to the Forest is about equally divided between the two categories.

The challenge for dispersed recreation is to provide a range of opportunities and areas desired by forest recreationists and at the same time provide for other Forest uses, and products demanded by other segments of the public. Many recreation users would like more dispersed areas, or at least an alternative

to Wilderness. Some would prefer low elevation areas near population centers suitable for year around use. Many who are associated with the timber industry, feel that dispersed recreation should not preclude timber harvest.

Most areas of the Forest supply diverse types of dispersed recreation experiences. A facet of this issue is that some dispersed activities conflict with each other and may be completely incompatible. This conflict is exemplified most clearly between dispersed nonmotorized/motorized uses, such as hikers/trail bikers, and cross country skiers/snowmobilers. Some recreationists would prefer to see snowmobiles and ORVs limited to designated areas apart from other types of use.

An aspect of the dispersed recreation issue that became more apparent from public comment between the DEIS and FEIS, was the role of rivers and river corridors in meeting recreation needs. One result of the increased interest in rivers was the designation of 2 Scenic and Recreation Rivers (upper McKenzie and NF of MF of the Willamette) and 2 Study Rivers (SF McKenzie and Blue River) in the Oregon Omnibus Wild and Scenic River Act of 1988. In addition to these rivers, the Little North Fork of the Santiam River is part of the State Scenic Waterways system. Public comments on the DEIS about the potential recreation and scenic values of other rivers on the Forest prompted a review of other rivers Forest-wide to determine which ones were eligible for Wild and Scenic River designation.

The scope of this issue also includes access and proximity of dispersed recreation opportunities to population centers and points of entry to the Forest. Many users associated with local hiking organizations desire more trails for hiking and other uses that are accessible at low elevation near population centers.

The responsiveness of the alternatives to this issue can be evaluated by considering the demand met and the number of acres that will provide semiprimitive nonmotorized and motorized opportunities. The number of Special Interest Areas provided and miles of trail constructed also indicate response to this issue.

Interrelationships with Other Major Issues

Old Growth: Many people enjoy recreational visits to old-growth forest for wildlife and plant viewing, camping, and solitude. Although large expanses of old growth inhibit some types of dispersed recreation, such as off-road vehicle (ORV) driving and horseback riding, these issues are generally compatible. There would be some interdependence in the amount of old growth retained in the different alternatives to the amount and type of dispersed recreation opportunities that the Forest would be able to provide.

Roadless Lands: The Forest's unroaded areas provide a destination for people who wish to participate in nonmotorized recreation activities outside of Wilderness. They may be closer to populated areas, and receive less visitation than the well-known Wilderness attractions. They offer opportunities for solitude and primitive experiences. Most of the roadless areas remaining on the Willamette are of a terrain and vegetation type that is difficult to access and unsuited for ORV use. Motorized recreation opportunities are limited or nonexistent in roadless lands.

Scenic Quality: The beautiful scenery of the Forest is one of the major recreation attractions. Driving for pleasure, which includes sightseeing, is one of the most popular activities on the Forest. Hiking, camping, and cross-country skiing are enhanced by pleasant visual experiences. In river corridors, scenic qualities of the rivers and adjacent forests are intergral to the recreation values.

Timber Supply: The roads that were constructed for the harvest of timber are now also the Forest access roads that facilitate dispersed recreation. Future timber harvesting could increase access for additional motorized recreation. Timber harvest has some potential to disrupt some recreation

opportunities. For instance, a timber sale may be planned that includes part of an existing trail system. The disruption is generally temporary, as funds are collected under the Knutson-Vandenberg Act for trail and trailhead restoration or replacement. Also, the noise and visual effects from logging operations are unpleasant to some hikers and campers.

Water: Many dispersed recreation activities are water oriented, so water quantity and quality are important to forest users. Maintaining reservoir water levels at historic levels is important to boaters. The supply of clean, cold water for fish habitat is of interest to people who enjoy fishing. There is the potential for very minor impacts on water quality in areas from dispersed recreation activities; two possible impacts might be from inadequate sanitation and erosion from overused trails. The water quality of rivers designated or eligible for Wild and Scenic Rivers is often one of the outstandingly remarkable values that contribute to the recreation experience.

Wildlife, Fish, and Plant Habitat: Dispersed recreationists use areas that are habitat for native species. These uses may have some impact on individual plant and animals living in those areas. There is likely to be little change in the overall habitat as a result of dispersed recreation activities, however, some recreation occurs because of the existence of the diverse Forest habitats, therefore a major change in habitats could affect some types of dispersed recreation. For example, a large reduction in forage and/or thermal cover for big game could reduce hunting opportunities. Logging old growth could disrupt bird watching.

Old Growth

Overview - There is general agreement among wildlife, recreation, and timber interests that some representation of stands of old-growth trees should be retained, but a wide disparity of opinion exists about how much is needed. Current allocations that provide for the preservation of old-growth timber stands include: Wilderness, Research Natural Areas, Old-Growth Timber Groves, and Undeveloped Roadless Recreation areas. Under the current plan, approximately 594,800 acres qualify as old-growth using the definition in the Pacific Northwest Regional Guide (R6 definition). Of this total, approximately 99,300 acres in the current plan are in allocations not subject to future harvest.

Old-growth timber stands are of special ecological concern because they represent a successional stage which provides unique habitat for certain species of plants and wildlife and because of their contribution to the forest gene pool. Some of the Forest's small animal species such as the red tree vole, flying squirrel, and spotted owl are completely or partially dependent on the old-growth canopy as part of their primary habitat. Plant species which have difficulty surviving in other than old-growth forest include certain saprophytes, such as candy-stick and pine-drops, and Oregon's small orchids, such as coral-root and fairy slipper.

Many people using the Forest for recreational purposes enjoy old-growth trees for their aesthetic and spiritual value. They consider old-growth trees as adding to scenic vistas, and providing cool shade, quiet, solitude, and a sense of history of the Forest. Old-growth stands are currently a significant component of both developed and dispersed outdoor recreation settings.

Conflicts arise because the existing old-growth stands contain large volumes of high quality timber which the forest industry in many cases would rather see made available for harvest. There are approximately 495,500 acres of old growth on suitable land which contain about 28 billion board feet of timber that could be available for harvest during the coming decades. Historically, the harvesting of mature Douglas-fir has been the backbone of the timber industry in the Pacific Northwest. Since there is still high demand for timber production from the Forest, the issue then becomes a question of how much old growth, which is not protected under preservation allocations such as Wilderness, should be

retained for recreational, aesthetic, spiritual, or habitat purposes and how much should be allocated for timber harvest.

Comments on the DEIS and activities during the development of the FEIS and Forest Plan indicate an intensification of public interest in the old growth issue. In addition to conflicts over the competing uses of this resource, comments on the DEIS also pointed to the lack of a consistent definition or agreement on what physical attributes of forest stands or criteria should be used to identify old growth. Since the DEIS there has also been increased attention to the specific physical characteristics of old growth and how these might be duplicated in managed stands. "New Forestry" or "New Perspectives in Forestry" are some of the terms that have recently evolved to describe a combination of silvicultural practices and harvest unit location considerations that are designed to maintain some of the ecological functions of old-growth stands throughout a timber rotation.

The responsiveness of the Alternatives to this issue can be evaluated by considering the acres of existing old growth retained on the Forest.

Interrelationships with Other Major Issues

Dispersed Recreation: Building additional roads as part of the harvesting of old-growth stands could increase access to different parts of the Forest, although leaving old-growth stands intact may provide destination points for people who participate in nonmotorized recreation. Stands of old growth provide scenic beauty to both motor and nonmotor recreationists. They provide solitude and quiet to those who walk into them.

Roadless Lands: The most extensive stands of old-growth timber that are outside of Wilderness are located in those parts of the Forest that have not been roaded for timber harvest. There is a strong correlation between these two issues and their resolution.

Scenic Quality: For many people, the appearance of the interrelationship of large trees, fallen trees, light and shadow, smaller plants and ground cover provide intrinsic scenic value. Stretches of old growth may also be attractive when viewed from a distance and add an appearance of texture to the overall scenic appearance of the Forest landscape. At some locations on the Forest, views of distant mountains and lakes may be obscured from travelways by stands of mature trees.

Timber Supply: The timber harvest program directly affects the amount of old growth which remains outside Wilderness and in other preservation type land allocations. With the demand to maintain or increase timber harvest levels, the demand to harvest old growth and to replace old-growth stands with faster growing second growth is likely to increase as well. Conversely, meeting the strong interest in retaining old growth for its scenic and wildlife values could lead to a reduction in allowable timber harvest. The issue of managing forest stands to retain certain structural components of old growth within managed forests, has introduced a potential means of addressing conflicts between timber supply and the ecological functions, and the wildlife habitat benefits of old growth. Values such as scenic quality, recreation and spiritual solitude would still be directly affected by New Perspectives Forestry, however.

Water: Old-growth stands provide high quality water due to the lack of disruptive activities and the filtering and stabilizing effects of the vegetative matter in the overstory and understory. Retaining old growth would have the effect of maintaining the status quo of water quantity (amount of runoff) and quality (no increase in sediment or water temperature) within the affected watershed. Harvesting old growth would have some short term potential for small amounts of change in the water draining from

the harvest area, though harvest impacts would be regulated in a manner to bring the water quality within limits allowed by Oregon Water Quality standards.

Wildlife, Fish, and Plant Habitat: Retaining the old growth will provide habitat for species dependent upon mature or older forest conditions. Old-growth areas contribute large material to streams and the forest floor which is unique to old-growth character forests. Old-growth areas also provide hiding and thermal cover for big game. "New Perspectives" or "New Forestry" concepts may also provide opportuntities to maintain critical habitat components of old-growth forests within a managed landscape.

Roadless Lands

Overview - Prior to the Oregon Wilderness Act of 1984, 294,775 acres of unroaded lands on the Forest were inventoried. As a result of that Act, 78,872 acres received Wilderness classification and 6,122 acres were included in the Oregon Cascades Recreation Area. There are now 380,805 acres of designated Wilderness within the Forest boundary, or roughly one-quarter of the National Forest System land on the Willamette. One area, the Mt. Hagan, 6,036 acres, qualified for further study as proposed Wilderness subsequent to the Oregon Wilderness Act of 1984. (See Chapter III, Section Q, Roadless Lands.)

The 209,845 acres remaining in an undeveloped condition were released to be planned for multiple use management, and the thrust of this issue is which of these areas should remain roadless. The issue surrounding roadless lands is focused on their use for amenity versus commodity values. Many members of the public, including recreationists, conservationists, and environmentalists prefer maintaining more undeveloped land for dispersed recreation use, wildlife habitats, preservation of natural ecosystems, and protection of soil mantles, water quality, and fisheries. Frequently, comments stressed that roadless lands are irreplaceable. Many people expressing concern for jobs, the area's economy, and the need for an adequate supply of wood products, also suggested that there is no need to preserve more roadless land, and that existing Wilderness should be better utilized.

Retaining the unroaded character of these areas provides options for semiprimitive nonmotorized recreation opportunities and possible future inclusion in the National Wilderness Preservation system. Future development options are not foreclosed by leaving these areas roadless during this planning period. Other benefits of maintaining the current character include preservation of the existing wildlife and plant habitat, opportunities for scientific research, and protection of cultural resources.

Allocating areas for roadless recreation limits the capability of these areas to produce some other benefits. Recreationists who rely on roads for access will not be served by these areas. Lack of immediate access hinders resource management activities and general administration as well as adding to the difficulty of controlling wildfires. This limitation may result in decreased economic returns from the Forest.

Road systems developed for timber management result in increased access to existing roadless areas, many of which are adjacent to Wilderness. Increased access could change visitor use patterns in Wilderness. The potential to view and hear timber management activities from the Wilderness could also increase, thereby reducing the quality of the overall Wilderness experience.

The responsiveness of the Alternatives to this issue can be evaluated by considering the acreage allocated to nondevelopment management areas.

Interrelationships with Other Major Issues

Dispersed Recreation: Retaining lands in an unroaded condition limits the ability of the Forest to provide some types of motorized recreation opportunities. Roadless areas provide primarily nonmotorized

recreation, and may decrease pressure for overuse in Wilderness by people looking for primitive experiences.

Old growth: Much of the acreage in the inventoried roadless areas is in an old-growth stand condition; therefore, retaining an undeveloped character in these lands would also preserve old-growth timber.

Scenic Quality: Retention of roadless lands would maintain some unbroken forest expanses which may be seen from overlooks and some distant travel corridors. It would also protect the scenic qualities of the existing vegetation type. There may be locations on the Forest where the development of an unroaded area may produce scenic vistas of mountains, lakes, rock formations, waterfalls, or other scenic attractions.

Timber Supply: If timber is held back from harvest, the pressure to cut in other areas of the Forest increases. Removing the timber in the inventoried roadless lands from the allowable harvest could reduce the potential for the Forest to meet local and national production needs and to support local economies.

Water: Retaining all current roadless areas in an unroaded condition would have little or no effect on water quality or quantity. Transpiration, run-off and sediment rates would remain the same if no development occurs. Development of the roadless areas may result in small amounts of change in water quantity; because of the implementation of protection measures directed by legislation and standards and guidelines, effects on water quality would be within the levels allowed by Oregon Water Quality standards.

Wildlife, Fish and Plant Habitat: Roadless areas provide wildlife habitat by having high snag levels, old-growth habitat, undisturbed riparian areas, and thermal cover. They provide potential sanctuary for sensitive or rare plant and animal species which are dependent on the natural undeveloped forest environment. Unroaded old-growth forest provides less forage for big-game animals than harvested areas, and provides little habitat for species that prefer vegetation in the early seral stages.

Scenic Quality

Overview - The scenic quality of the Forest has been identified as an important dimension of the use of the Forest by recreationists, travelers, and nearby residents. As more people are living near the Forest and visiting for recreational activities, public interest in and values expressed about the appearance of the Forest landscape has increased. Providing for other uses of the Forest, such as timber harvest and utility corridors, may affect the scenic quality of viewsheds which are visible from travelways, homesites, and recreation sites.

The high recreational values of the Forest are directly linked to its beautiful scenery. Resource management activities, including road construction and logging, can open up scenic vistas and routes to natural attractions.

Some segments of the public, and many who recreate in the Forest or are engaged in recreation related or dependent businesses prefer use of methods, throughout the Forest, to maintain scenic resources that are as natural as possible. Most who are concerned about scenic quality want impacts to the scenic resource minimized within road corridors and would like scenic resources maintained in areas of high recreational use. Many members of the public who could be affected by a declining harvest or are associated with the wood products industry feel that scenic quality should not be emphasized to the extent of great cost or the curtailment of timber production; management activities should not be

hidden from public view to meet aesthetic requirements; and that maintaining scenic values should not significantly reduce other resource ouputs or programs.

The responsiveness of the Alternatives to this issue can be evaluated by the acreage allocated to Visual Quality Objective prescriptions.

Interrelationships with Other Major Issues

Dispersed Recreation: Some dispersed recreation activities, (driving for pleasure, photography), are directly related to scenic quality, while others, like hunting, are less dependent on the visual appearance of the Forest. Hikers and campers are generally interested in visually pleasing surroundings. A major change in the observed landscape could change the focus or location of dispersed recreationists, but would not be expected to cause a decrease in Forest visitation.

Old Growth: For the people who prefer to view an unbroken forest canopy, seeing old growth is pleasant. Others may feel that it is dark and foreboding, or that it is blocking distant scenic vistas. Large, individual trees that are characteristic of old growth, are attractive and aesthetically pleasing in many forest settings such as along major travelways, trails and campgrounds. Generally, old growth adds to the overall beauty of the Forest landscape.

Roadless Lands: Access to some scenic attractions in unroaded areas may be restricted by the lack of roads. From scenic overlooks, roadless areas contribute to the appearance of the overall panorama of the Forest.

Timber Supply: Management for the production of wood products has the greatest potential for affecting scenic quality. The road construction and logging that are part of timber harvest change the appearance of the viewshed. In many cases, the most drastic changes of forested to nonforested land is short-term as regenerated stands restore a forested appearance with a few years. Other changes such as height of trees or texture of the canopy between young stands and old growth have longer term effects on visual appearance. Some people who are concerned about possible reductions in timber supply feel that visual concerns should receive less consideration than management for timber production.

Water: Viewing bodies of water as part of the recreational setting on the Forest adds to a pleasant visual experience. A serious degradation of water quality could decrease scenic quality. These two issues are generally compatible.

Wildlife, Fish, and Plant Habitat: There is little conflict between these two issues. Maintaining a variety of scenic landscapes could add to meeting the need for providing a diversity of habitats. The opportunity for viewing wildlife and plants adds to the scenic attraction of the Forest for recreation visitors.

Timber Supply

Overview - The amount of timber harvested each year from the Forest is important nationally as well as regionally. The average annual amount of timber sold, since 1977, has been 778 MMBF (all volume), while the amount harvested has been 672 MMBF. The Allowable Sale Quantity (ASQ) under the current plan (approved in 1977) is about 800 MMBF. This supply of timber supports approximately 16,500 primary and secondary jobs in the Upper Willamette Basin. Millions of dollars circulate through the Federal Treasury, several Oregon counties, and local businesses, that are directly related to Forest timber. Because of its economic significance, the continuation of the flow of this timber supply is of

high interest to the public. There is a detailed discussion of the economic contributions of, and demands for, timber harvest in Chapter III, Social and Economic Environment, and Timber.

Legislation passed by Congress mandates that forests capable of producing commercial timber do so. The amount produced from each forest, however, is determined by the capability of the forest itself. The amount of wood that can be offered for sale each year is based on the amount of land suitable for timber harvest, the amount of volume that the land is physically capable of producing, the other resource uses of the Forest and the intensity of timber management activities.

The instances in which timber harvest may have a perceived negative effect on other resources cause this management activity to be a public issue. The major focus of this issue is the level of timber harvest to be provided during the plan period and in later decades. At the core of the issue is the conflict between harvest levels and the preservation of old-growth timber stands, roadless areas, and wildlife habitats and the maintenance of scenic quality.

Many members of the timber industry feel that measures should be taken to increase timber production and minimize the emphasis on other resources. Some members of this group feel that management of timber resources should be the primary use of the Forest. Many members of conservation and environmental groups believe that there is too much timber harvesting, especially of old-growth timber. They feel that much of the old growth should be preserved, even to the point of encouraging builders to seek alternatives to wood for building materials. Many recreation and Wilderness advocates believe that roadless lands should be maintained in their undeveloped condition as they are irreplaceable. Most wildlife interest groups feel that heavy timber harvest will be harmful to some wildlife, particularly old-growth dependent species such as the spotted owl. Many recreationists would like areas within travel corridors and around recreation sites and areas to remain natural appearing and prefer that the visible effects of timber harvest should be minimized.

Current inventory data and accurately modeling the production capabilities of the Forest are key aspects of the timber supply issue emphasized in public comments on the DEIS. Since laws and regulations concerning Forest Plans are explicit about how allowable harvest levels and the resulting timber supply are determined, there is a high level of concern that the best available information on inventory and production capabilities be used.

The responsiveness of the Alternatives to this issue can be evaluated by considering the Allowable Sale Quantity (net), the Timber Sale Program Quantity (gross), and the number of cords of firewood provided.

Interrelationships with Other Major Issues

Dispersed Recreation: Timber management can be compatible with motorized dispersed recreation, because roads are constructed and maintained to support harvest activities, increasing access to different areas on the Forest. It may be considered in conflict with nonmotorized recreation by some Forest users because of noise, increased traffic occurrence, and a reduction in specific types of recreation opportunities.

Old Growth: Large old-growth Douglas-fir has been a major component of the timber supply from the Forest. Many local mills are tooled for manufacturing wood products from this type of timber. The remaining old-growth forests could contribute a significant quantity toward the Forest's harvest. Harvesting the old growth would reduce habitat for several wildlife and plant species, and reduce some scenic and recreation values associated with that plant community type.

Roadless Lands: Roads constructed in unroaded areas to access timber for harvest and administration purposes would change the roadless character. Timber harvested by aerial logging methods will alter the appearance of the unroaded area. Both of these activities would reduce the potential for future Wilderness designation. Leaving the roadless lands out of the landbase of the allowable timber harvest could reduce the amount of timber supplied from the Forest for wood products.

Scenic Quality: The scenic character of the Forest landscape is changed by road construction and timber harvest. Access to scenic views may be created through harvest activities. Harvest units may be evident from travel corridors, overlook points, and areas of recreational use.

Water: Water quality and quantity can be greatly affected by resource development activities. Consequently, timber harvesting is carried out under regulations, and standards and guidelines for protection. The alternative management strategies considered in this FEIS all provide at least the minimum legally required protection. There may be some variation in water yield and quality related to the amount of timber harvest allowed.

Wildlife, Fish, and Plant Habitat: Big game forage habitat can be improved through the creation of openings in closed stands of timber. The removal of extensive areas of the Forest canopy can reduce thermal cover which big-game animals need for protection. The vegetation manipulation which occurs during timber harvest changes the character of the habitat environment for different species of animals and plants. Habitat quantity and quality may be increased for some species, and decreased for others. Under the Knutson-Vandenberg Act, funds collected from timber sales may be used for projects to improve fish and wildlife habitat.

Water

Overview - The purity and abundance of the water which flows through the Forest is important to other forest resources, to the people who reside in Oregon, and to those who visit the Forest. The water is used for domestic water supplies, irrigation, fishery habitat and fish hatcheries, power generation, and a wide variety of recreation activities. The issue of water quality is primarily focused on long-term effects of suspended sediments (turbidity) and temperature of fisheries habitats resulting mainly from the rate and distribution of timber harvest activities and road construction. Some public attention has also been directed at the possible introduction of chemicals and bacterial contamination into Forest waters. Some domestic water-supply users and many fish and wildlife habitat interests believe that harvest activities adjacent to lakes, rivers, and streams may have adverse effects on water quality. Some from these interest groups feel that new road and trail access to lakes should be prohibited. Many timber industry members feel that current standards governing harvest in riparian zones are adequate for protection of water quality and riparian habitats. They also feel that additional constraints will increase costs, reduce harvest volumes, and ultimately reduce employment levels. Some members of the general public would like to see an end to the use of chemicals to enhance tree growth and control competing vegetation because of potential health hazards, from the risk of contaminating Forest lakes, rivers, and streams. Others feel that the use of chemicals is essential in maintaining annual harvest volumes.

The responsiveness of the Alternatives to this issue can be evaluated by considering the "Adverse Watershed Impact" Ratings and amount of erosion.

Interrelationships with Other Major Issues

Dispersed Recreation: Some dispersed recreation activities may adversely affect water: overuse of trails next to streams could increase sediment in the streams; increased hiking by people and dogs

increases the possibility of the spread of bacterial contaminants such as *giardia lamblia*; overuse of off-road vehicles can cause soil loss and erosion. Water supports many types of dispersed recreation, such as fishing and boating, and adds to the enjoyment of others, such as camping and sightseeing.

Old Growth: The abundant rainfall in the Cascades is a major factor in the existence of large old-growth Douglas-fir and Western red cedar trees. Old-growth stands provide high quality water by preventing erosion and providing thermal cover for temperature stability.

Roadless Lands: These two issues are compatible; the existence of unroaded areas has no adverse effect on the water resource.

Scenic Quality: Water is a major component of the Forest's scenery. The lush vegetation is due to the amount of precipitation. Water features such as rivers and lakes are viewed by most people as positive visual experiences. Management activities designed to enhance scenic quality would generally also be compatible with watershed protection.

Timber Supply: Harvesting trees and the road-building that may accompany logging operations are the resource management activities that have the greatest potential for impacting water quality. There may be a greater amount of water runoff from lands where large vegetation has been removed, as well as increases in sedimentation and water temperature.

Wildlife, Fish, and Plant Habitat: Protection of the water quality and quantity is vital to the protection of habitats for native and desireable nonnative species. The water conditions of the Forest contribute to the diversity and richness of wildlife and plant habitats. The standards which are followed to measure water quality and quantity are designed to avoid adversely affecting aquatic species.

Wildlife, Fish, and Plant Habitat

Overview - The Forest is home to a diverse array of wildlife, fish, and plant species and provides reproductive habitat for over 170 avian breeding species, 64 mammalian species, 30 amphibian and reptilian species and numerous sensitive plant species. Depending on the amount and condition of available habitats, species populations will fluctuate over time. The relationship of these species to their habitat is complex and not every detail is completely known or thoroughly understood. However, biologists do know that the success of a species to inhabit a given environment is dependent on several factors to meet basic survival and reproductive requirements. One such significant factor is the amount extent, condition, and quality of species supporting habitat.

The wildlife, fish, and plants issue is centered on the conflict between timber harvest and providing sufficient habitat, with the desired attributes of extent, condition, and quality, to ensure sustained viable populations of native species.

Most who favor protection of wildlife, fish, and plant habitats believe that timber harvest levels are too high to sustain current habitats for a diverse range of species. Many members of these wildlife interest groups feel that diverse habitats should be provided but that species emphasis should be placed on preservation of habitats of old-growth dependent species. Some from these interest groups also feel that timber harvest is important for big-game species but that connected and undisturbed corridors should be left for old-growth dependent species.

Many members of the public associated with the timber industry feel that Wilderness and other "set-aside" areas provide adequate habitat for old-growth dependent species, such as the spotted owl. They feel that wildlife habitats are enhanced by timber harvest and that sustained yield timber management

will provide habitat adequate to meet wildlife needs. Many others associated with the timber industry feel that timber harvesting is a vital part of the multiple use concept and it should not be excluded to provide for wildlife, fish, and plant habitats and that over-dedication for nonharvest uses could lead to an economic decline.

The responsiveness of the Alternatives to this issue can be evaluated by considering the habitat provided for certain indicator species.

Interrelationships with Other Major Issues

Dispersed Recreation: One of the major components of dispersed recreation is related to enjoyment of fish and wildlife and plants. Many outdoor recreation trips include photography, viewing, fishing, and hunting. Forest visitors may adversely affect some native and desireable nonnative populations by picking rare plants, disturbing nesting sites, or poaching. Managing to provide diverse habitats will generally enhance dispersed recreation opportunities.

Old Growth: This mature forest type provides habitat for many small species of birds and animals and plants that do not thrive in other habitats. It also provides thermal cover for protection of big-game animals. Riparian areas associated with old growth provide high quality habitat for native species; large, stable logs down in streams form pools where fish can live and hide. These two issues are strongly interrelated and are compatible.

Roadless Lands: The remaining unroaded areas on the Forest add to the diversity of habitats of the current condition. They support populations which are dependent on old growth and provide hiding cover for big game.

Scenic Quality: The diversity of habitats on the Forest is part of the varied landscape which gives the Forest much of its visual appeal--from the low elevation old growth, to lush meadows, to the alpine regions.

Timber Supply: Total populations of big game have increased since the last century, as timber harvest has created openings for forage for elk and deer. However these animals also need thermal cover, which exists under a closed forest canopy. Since previous harvest activity has reduced the amount of old-growth forests on the Forest, managing to maintain viable populations of all wildlife, fish, and plant species may cause a reduction in the available timber supply in the future.

Water: The amount of clean, clear water available is a critical part of the range of habitats that exist on the Forest. Abundant rainfall and an extensive stream system support many species of plants and fish. Protection of this resource is as important to the native species as it is to the people who now inhabit the region.

CHAPTER II

ALTERNATIVES INCLUDING THE PROPOSED ACTION

INTRODUCTION

This chapter summarizes the content of the Final Environmental Impact Statement (FEIS). It covers the changes made in the alternatives and their analysis in response to public comments on the Draft Environmental Impact Statement (DEIS), describes the process used to develop a full range of alternatives for the FEIS, describes the goals and management objectives of each alternative, and compares the physical, biological, social, and economic outputs and effects of the alternatives considered in detail.

Chapter II focuses on alternatives and is linked directly to other parts of the FEIS. Alternatives were developed in response to the issues described in Chapter I and Appendix A. Chapter III discusses the environment which would be affected by management of the Forest in the alternatives. Chapter IV discusses the consequences of alternatives on the environmental components in detail. These consequences are represented in part by the outputs and effects presented in Chapter II. The analysis tools and processes summarized here are presented in detail in Appendix B, Description of the Analysis Process.

This FEIS presents in detail seven different alternatives for managing the lands and resources of the Forest. These alternatives explore a variety of ways of responding to the issues identified during the planning process. Each alternative represents a unique combination of land allocations, management prescriptions, activity scheduling, and results in different mixes of goods and services, land uses, and environmental effects result.

The planning regulations (36 CFR 219.12(e) and (f)) require an analytical process which includes an evaluation of various minimum and maximum resource and economic production levels. In addition, a wide range and relatively even distribution of alternatives must be developed to respond to issues and to reflect national goals such as the Resources Planning Act (RPA) program.

In some alternatives the Forest would be managed to emphasize the production of commodities with a market price. Other alternatives would emphasize resources that do not have a market price, such as dispersed recreation, wildlife, and scenery. One alternative, the No Change Alternative, reflects current management direction projected into the future. Another alternative, the No Action Alternative, reflects current management direction projected into the future including NFMA requirements. Two alternatives were developed in response to requests from public interest groups. One alternative was developed in response to public comments on the DEIS.

This broad range of alternatives provides the Regional Forester with the information needed to identify the alternative which comes nearest to maximizing net benefits to the public.

The basis for developing alternatives is outlined in the implementing regulations of the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA). NEPA regulations (40 CFR 1502.14) direct agencies to:

- Rigorously explore and objectively evaluate all reasonable alternatives; and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.
- Devote substantial treatment to each alternative considered in detail, including the Proposed Action, so that reviewers may evaluate their comparative merits.
- Include reasonable alternatives not within the jurisdiction of the lead agency.
- Include a No Action alternative.
- Identify the agency's Preferred Alternative (PA) as the Proposed Action.
- Include appropriate mitigation measures not already included in the Proposed Action or other alternatives.

The implementing regulations (36 CFR 219.12(f)) for the National Forest Management Act (NFMA) contain the following requirements for alternative formulation:

- Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the Forest. Alternatives shall reflect a range of resource outputs and expenditure levels; however, potential budgetary limitations do not constrain resource outputs.
- Alternatives shall be formulated to facilitate analysis of opportunity costs and of resource uses and environmental trade-offs among alternatives and between benchmarks and alternatives.
- Alternatives shall be formulated to facilitate evaluation of the effects on present net value (PNV), benefits, and costs of achieving various outputs and values that are not assigned monetary values are provided at specified levels.
- Alternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process.
- Reasonable alternatives which may require a change in existing law or policy to implement shall be formulated (if necessary) to address a major public issue, management concern, or resource opportunity identified during the planning process (40 CFR 1501.7, 1502.14(c)).
- At least one alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives for each Forest displayed in the Regional Guide.
- At least one alternative shall reflect the current level of goods and services provided by the unit and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures this alternative shall be deemed the No Action Alternative.

- Each alternative shall represent to the extent practicable the most cost-efficient combination of management prescriptions examined that can meet the objectives established in the alternative.

- Each alternative shall state at least the condition and uses that will result from long-term application of the alternative, the goods and services to be produced, the timing and flow of these resource outputs together with associated costs and benefits, the resource management standards and guidelines (S&Gs), and the purposes of the management direction proposed.

Alternatives were developed with varying levels of supply potential for the high level of demand for most resources found on the Willamette National Forest (WNF). The ability of the Forest to respond to the levels of demand for the resources was determined through benchmark analysis of key resources. These benchmark analyses identified the range of supply potential possible for both priced and nonpriced resources. Priced resources are those which have a quantified market price, while nonpriced resources are those which are not exchanged through the marketplace. The comparison of alternatives in the latter section of this chapter shows the ability of the alternative to meet identified demand levels.

The planning regulations and agency direction emphasize the use of economic efficiency criteria in the major analytical phases of the planning process. The development of management prescriptions, analysis of benchmarks, management constraints, and alternatives are steps which focus on cost-efficiency and the calculation of economic and resource trade-offs.

CHANGES BETWEEN DRAFT AND FINAL

The DEIS and Proposed Forest Plan documents were available for public review for approximately 5 months (January to May, 1988). The public review process and comments received during the review period are described in the FEIS Chapter I, Appendix A, and Appendix I. After the public comment period had closed and the comments had been reviewed, the Forest interdisciplinary team (IDT) explored ways to respond to the concerns of the public. (A complete discussion of content analysis and Forest responses to substantive comments are in Appendix I.)

Many of the comments suggest:

- Alternatives be modified;
- Alternatives be developed or evaluated that were not given serious consideration in the DEIS;
- Analyses presented in the DEIS be supplemented, modified, or improved;
- Factual corrections be made in information or data used in the analyses.

After reviewing these comments, the IDT and Forest management team agreed on changes that should be made in the FEIS. In some cases, the changes involved analysis methods and data common to all of the alternatives. Other changes involved considering alternatives not analyzed in the DEIS while dropping others that had been analyzed. The new alternatives were developed based on the public response to specific issues and the proposed resolution of these issues displayed in the DEIS. The new alternatives propose different land allocations, management prescriptions, and S&Gs from the set of alternatives analyzed in the DEIS as means of resolving issues.

The IDT updated or reanalyzed all of the alternatives considered in the FEIS. As a result, a new Preferred Alternative (PA) was identified: Alternative W. The Forest Plan was revised to reflect the proposed changes between Alternative J, the PA in the DEIS, and Alternative W. The Plan and the FEIS were submitted to the Regional Forester for review.

Following is a summary of revisions made between the DEIS and FEIS to respond to concerns raised during the public comment period.

Alternatives

- Alternatives B and J-Departure were dropped from the set of alternatives considered in detail. Both proposed a timber sale schedule that departed from long-term sustained yield capacity. Public responses were largely indifferent to the departure alternatives as a means of addressing the timber supply issue. Concerns were raised, however, about the environmental effects associated with the departure alternatives. Environmental effects of the departure alternatives were generally the most adverse of the range of alternatives considered in the DEIS (see Chapter IV, DEIS).
- Alternatives C and I were also dropped as alternatives considered in detail in the FEIS. While there was a moderate amount of favorable public comments on both of these alternatives, other alternatives were proposed and considered in the FEIS that address similar goals and objectives.

- Alternative K was added in response to public comments. Many individuals, as well as timber industry organizations, expressed a desire for an alternative that would maintain the timber harvest near the level in the current plan (1977). Although similar to Alternative I in the DEIS in some respects, differences in specific resource goals and objectives led to developing Alternative K. The Willamette Forestry Council (WFC) played a major role in advising on the development of Alternative K.

- Alternative L was also added in response to public comments that noncommodity uses of the Forest were not adequately represented in the alternatives in the DEIS. Many people were concerned that an alternative proposed by the Oregon Natural Resources Council (ONRC) for the DEIS was not fully analyzed. Alternative L was developed with suggestions from ONRC and affiliated groups.

- Alternative W (PA) was added to the set of alternatives largely in response to comments on Alternative J, the PA in the DEIS. Although the initial thought was to modify Alterative J in response to the criticism, it became apparent that the significance of the changes in specific resource practices as well as overall goals and objectives were as great as the differences between some of the alternatives considered in the DEIS. A new alternative was developed to help the public see and understand the differences.

Modeling and Technical Changes Common to All Alternatives

General

- The FORPLAN model used for DEIS analyses was a Forest-wide model in which similar lands were aggregated across the entire Forest. Reviewers of the DEIS commented that the Forest-wide analysis was not adequate to address critical issues such as water quality. In response to these concerns, a watershed specific FORPLAN model was developed and used in the analysis of alternatives in the FEIS. The revised FEIS model identified 33 major watersheds as the base geographical unit for aggregating similar lands.

- Because of the change in the model design, the way in which many of the resource prescriptions and requirements are modeled were also modified. Refer to Appendix B, *Description of the Analysis Process* for more details on these adjustments. Changes in the management direction or intent of the prescriptions are noted in the following pages.

Timber

- The timber inventory condition classes were updated for the acres of forest harvested or planned to be sold through September 1989. The acres of seedling and sapling stands destroyed in the Shady Beach Fire in September 1988 were also modified in the inventory to reflect the current condition.

- The starting timber yield tables were adjusted to show the expected volume per acre in 1994, approximately the midpoint of the planning period.

- The breakage and defect factors used to determine net volume in the timber yield tables were revised to better reflect the differences between stands of old, large trees and younger, smaller trees. In the DEIS a Forest-wide average for defect and breakage was applied to all condition classes regardless of size and age.

- Young stands in the Douglas-fir/western hemlock inventory component (the predominate timber component by acreage) between the age of 0-40 were stratified into four, 10-year age groups. In the DEIS these stands were combined into 2 groups.

- Old growth and large sawtimber condition classes were treated separately in the FORPLAN model rather than as a single group as was the case in the modeling for the DEIS.

- A prescription for a single application of fertilizer is available for all suitable acres that are predominately Douglas-fir. A maximum of approximately 450,000 acres additional acres were available for fertilization depending on lands available for timber management by alternative. In the DEIS fertilizer availability was limited to soil types that had been tested and shown positive results. A clarification of the Regional policy expanded the availability based on observed results over many soil types in Western Oregon.

- A standard was added to all alternatives that required directional felling of all large sawtimber and old-growth stands on slopes over 30% during harvest operations. This requirement was estimated to reduce volume lost to breakage by approximately 2% in large sawtimber and old-growth stands. The gain in net volume was included in the empirical yield tables.

- A prescription that allows a single, heavy commercial thinning entry as compared to two, lighter entries, was added to the set of prescriptions available in FORPLAN.

- Merchantable sawtimber volume from recent mortality in the empirical yield tables was included in the ASQ projections. This volume was not included in the empirical yield projections in the DEIS. Deductions for wildlife trees have been taken into account in determining this volume.

- The Pacific Northwest Region's *FEIS for Managing Competing and Unwanted Vegetation* was released after the Forest DEIS. Changes were made to management direction to be consistent with the guidelines presented in the FEIS and the intent of the mediated agreement.

Economics

- Timber values were updated to include the average value of stumpage harvested between 1977 and 1988.

- Costs used to determine the Forest budget by alternative were recalculated using the latest unit costs and were organized under the current accounting system.

Old Growth

- The mature and overmature survey (MOMS) of vegetation has been used to calculate acres of old-growth forests for display and analysis in the FEIS. The MOMS inventory utilizes photo-interpreted stand variables such as species, size, density, and stand structure to determine acres of old growth by various criteria. The timber inventory condition classes were used to estimate acres of old growth in the DEIS.

Wildlife

- The size and distribution of Spotted Owl Habitat Areas (SOHAs) were remapped to comply with S&Gs (S&Gs) selected in the Record of Decision for the *Final Supplement to the EIS for an Amendment to the Pacific Northwest Regional Guide, December 1988*. There are 59 SOHAs in the FEIS compared to 62 in the DEIS. The size of individual SOHAs increased from 1,000 to 1,500 acres. The tentatively suitable acres within SOHAs in the FEIS is 62,000 as compared to 46,400 in the DEIS.

- Mapping of the mature conifer habitat managed for wildlife species such as the pileated woodpecker and the marten was adjusted to account for the new distribution of SOHAs. The tentatively suitable acres in the management requirement network for these species in the FEIS is 19,133 as compared to 8,720 in the DEIS.

- Mapping of the mature conifer habitat for species represented by marten as the indicator species was extended to all elevations on the Forest. In the DEIS habitat was not identified and mapped at elevations below 4,000 feet on the southern end of the Forest.

- Big-game evaluations in the FEIS used *A Model to Evaluate Elk Habitat in Western Oregon*. This model incorporates the factors of cover, forage, and animal security to evaluate how well overall habitat conditions meet animal needs.

- Modeling of wildlife trees needed to provide habitat for primary cavity excavators was changed to ensure the management requirement level could be met in each individual stand and at the subdrainage level. Some alternatives have objectives higher than the management requirement. Timber volumes per acre were reduced by about 2 to 10% to reflect the number of trees necessary to provide the management requirement or habitat objectives of each alternative.

Soil and Water

- A data base error in interpreting unsuitable soils in the Soil Resource Inventory reduced the tentatively suited acres in the DEIS by 29,400. The error was corrected and the acres added to the tentatively suitable acres.

- Approximately 11,000 acres were removed from the tentatively suitable land base to meet the management requirements for riparian areas. The prescription for the management requirement level in the DEIS identified 21.5% of riparian acres for removal from the tentatively suited acres. In the DEIS these acres were assumed to occur only on other areas withdrawn from the suitable acres. After a reevaluation of original riparian inventory results, it was revealed that removing 21.5% of the acres evenly distributed across all riparian areas provided a more accurate model representation.

- As a result of public input and management concerns over watershed management and water quality, current practices (Best Management Practices, (BMPs)) designed to protect and enhance water quality are highlighted in the Forest-wide S&Gs in the Forest Plan, in FEIS Chapter IV, and in FEIS Appendix H. This appendix has been included as mitigation common to all alternatives, and as a response to input to the DEIS.

Rivers

- In October 1988, the Oregon Omnibus Rivers Act designated the North Fork of the Middle Fork of the Willamette and the Upper McKenzie rivers as Federal Wild and Scenic Rivers. Prescriptions for either Recreation or Scenic classifications are applied to these river segments in all alternatives.

- The Omnibus Rivers Act also directed that the South Fork of the McKenzie River and Blue River be studied for potential classification and eligibility as Wild and Scenic Rivers. Constraints applied in all alternatives protect the resource values of these rivers and along a 1/4-mile corridor on each side.

- Based on input to the DEIS, a Forest interdisciplinary river review team has evaluated 13 rivers across the Forest for eligibility under the Federal Wild and Scenic Rivers Act. As a result of this review, 10 rivers were identified as being eligible. Prescriptions that protect the outstanding resource values of elgible rivers and the 1/4-mile corridor on each side have been modeled in all alternatives.

Management Areas (MA)

- SOHAs and designated mature conifer habitat for pileated woodpecker and marten indicator species have been identified as individual MAs. In the DEIS these areas of reserved habitat were tracked in the mapping system but were not identified as MAs with individual prescriptions.

- An evaluation of certain prescriptions indicated similar management objectives and S&Gs that could be combined to simplify mapping and reduce repetition in the S&Gs. Consequently, the following MAs in the DEIS have been collapsed into single MAs in the FEIS: MA 4a and 4b, Research Natural Area; MA 5a and 5b, Special Interest Areas; MA 7a and 7b, Old-Growth Groves; MA 12a, b and c, Developed Recreation Areas; and MA 9a and b, Special Wildlife Habitats.

- Wild and Scenic Rivers MA 6 was expanded to MA 6a, Wild Rivers; MA 6b, Scenic Rivers; and MA 6c, Recreation Rivers to provide direction necessary to model designated and eligible rivers under the Federal Wild and Scenic Rivers Act.

- To better reflect management direction for the Hardesty Mountain area on the southwest side of the Forest, the following MAs were added in the FEIS: MA 5b, Hardesty Mountain Ecological Area; and MA 14b, General Forest-Deferred.

- MA 10f, Dispersed Recreation-Lakeside Zones was added. Many of the land allocations in this MAs were in MA 9c and d, Special Lakeside Habitats-Enhancement/Protection, in the DEIS. Since the management direction and objectives in MA 10f are similar to Draft MA 9c and d, these areas were included in the Final MA 10f.

- MA 15, Riparian Areas, was added. The prescription for this MA exceeds the management requirements for streamside management to meet water quality and is not used in all alternatives. Management requirement prescriptions for riparian areas are listed as Forest-wide S&Gs in Appendix D.

Changes Between DEIS Preferred Alternative (PA) (Alternative J) and FEIS PA (Alternative W)

- The FEIS PA recognizes riparian areas as an important feature in the forest landscape for a number of resources. Additional protection has been provided for these sensitive areas by allocating Class I, II, and III rivers and streams, wetlands, and lakeside areas to MA 15 with a prescription of no programmed timber harvest. The width of this no-harvest zone will be located after on the ground reconnaissance but in most cases ranges from 200-400 feet on Class I rivers to 75-150 on Class II and III streams.

- There is increased emphasis on watershed management and water quality. In addition to MA 15 direction, S&Gs have been added to provide protection for Class IV streams in moderately stable and potentially highly unstable soils. These S&Gs provide a no-harvest buffer of 25 to 100 feet to reduce risks of mass soil movement, maintain bank stability, and act as a source of large wood input to the stream channel for sediment control.

- The acres and rate of harvesting have been distributed by subdrainage to minimize potentially adverse effects of peak flow on stream channels.

- Objectives for elk management have been clarified as a result of mapping 212 emphasis areas across the Forest that specify a high, moderate, or low habitat objectives that are linked to a specific set of Forest-wide S&Gs.

- Management emphasis on cavity excavator habitat was reduced. The FEIS PA provides for maintaining 40% of the biological potential by subdrainage rather than 60% Forest-wide.

- A prescription was developed and used in the PA to provide for managed, mature conifer habitat required for pileated woodpecker and marten indicator species in MAs where rotations of 150-200 years were required to meet recreation and scenic objectives. This prescription applies to approximately 20% of the habitat areas for these species.

- Management practices that directly affect the diversity of plants and animals across the Forest have been addressed and a specific group of S&Gs, *Biological Diversity*, has been added to the Forest-wide S&Gs in the PA. This section also includes management direction for categorizing old-growth stands, reducing the rate of fragmentation of the landscape maintaining corridors of mature stands as links across the Forest, and providing large dead wood in all stands.

- Standards and guidelines have been added to MAs with rotation lengths of 150 years and longer to provide for the maintenance of structural features of old-growth stands which would provide old-growth habitat characteristics. Approximately 10 live overstory trees will be left along with down large wood and managed for a diverse species mix.

- Areas managed to protect visual quality were redefined to more closely reflect the areas that can actually be seen from major highway corridors (key viewing points). Overall, the acres allocated to a management emphasis of modification visual quality objective are approximately 77,000 acres less. Partial retention acres are 4,500 less and retention acres are 5,000 less in the FEIS PA than in the DEIS PA.

- More acres are allocated to MA 5a, Special Interest Areas (+9,257 acres); MA 7, Old Growth Groves (+917 acres); and MA 9a, Special Wildlife Habitats (19,988 acres); in the FEIS PA than in the EIS PA. The additional acres allocated to these MAs provide additional protection for special biological, cultural, or geological features that exist on the Forest.

ALTERNATIVE DEVELOPMENT AND ANALYSIS

The following sections describes how the overall themes and resource issues were identified and developed into a range of alternative land allocations and management direction responsive to NFMA, NEPA, and the public. Readers are encouraged to refer to Appendix B for a more complete and technical discussion of the development and analysis process.

Information on the amount and location of resources has been compiled through inventories of timber conditions, recreation use, wildlife populations, soil and water resources, and roads. These inventories were combined in the Geographical Mapping System (GMS) for use in the development and analysis of alternatives. This information was collected on a common map base, with different map layers developed for the various resources and inventory components. This step resulted in the identification of more than 65 layers of resource attributes and management opportunity delineations. This data base was updated between the DEIS and FEIS to reflect changes in land suitability, timber harvest and growth, and a revision of the spotted owl habitat network.

Alternative Development

The alternative formulation process began in November 1984 with a review of Forest issues, concerns, opportunities and resource inventories; resource production capabilities identified in the analysis of the management situation; and applicable planning direction. Based on a review of these items resource management options were developed for nine resource areas: Recreation; Fish and Wildlife; Timber; Range; Soil, Water, and Air; Minerals and Energy; Lands; Facilities; and Protection. Each option was comprised of management direction statements for the important factors for that resource. The resource management options were designed to incorporate issues, reflect a particular level of management emphasis, and serve as a potential building block for Forest management alternatives.

The draft resource management options were reviewed by the public during 1985, with the knowledge that the resource management options would be used as building blocks for alternatives. The public response was evaluated and the resource options were modified to reflect the public comments. The resulting options were used as building blocks in the development of preliminary alternatives.

A review of the options for the nine resource areas indicated that some resources relate primarily to the allocation of land and scheduling of timber harvests for achievement of their objectives (Timber, Recreation, and Fish and Wildlife), while other resources are primarily dependent on program budget and/or administrative action.

Since Timber, Recreation, and Fish and Wildlife are dependent on the allocation of land areas, actions emphasizing one of these resources has a direct effect on the others. The options for these resources were, therefore, compared to each other to determine their compatibility. Compatibility was judged by the Interdisciplinary Team based on the team's knowledge and experience. The six Recreation options, and seven Fish and Wildlife options were compared with each other and were compatible through all 42 possible combinations. These 42 options were then compared to the seven timber management options. Depending on the extent to which Recreation and Fish and Wildlife were emphasized, the timber options were compatible at some levels of production. This comparison resulted in 106 possible combinations of these three resources that could be compatible within an integrated alternative.

Since the range of management options for the resources included output levels close to the minimum and maximum benchmark levels, the preliminary alternatives formulated were by design within the range of benchmark levels, and spread throughout the entire range. Benchmarks are discussed in

additional detail later in this chapter. From these 106 conceivable alternatives, nine preliminary alternatives were identified, based on the following objectives:

- Minimizing the number of alternatives in an array that would still include all of the resource management options,
- Minimizing the duplication of resource options in the array, and
- Maximizing diversity in the mix of resource option combinations.

The resource options for Range; Soil, Water, and Air; Minerals and Energy; Lands; Facilities; and Fire Protection were then compared to the nine preliminary alternatives to determine their compatibility. Most of the options of these six resource areas were found to be compatible with the preliminary alternatives. Options for these resources were then incorporated into each preliminary alternative at a level consistent with the general emphasis of each alternative.

From the combinations of resource option descriptions nine preliminary alternative descriptions were written and rough estimates of some outputs were made. Two preliminary alternatives were dropped due to significant overlap and duplication. These seven alternatives were examined as to how well they resolved major facets of the Forest issues. In doing this the following factors were considered:

- Does the range of alternatives provide an appropriate magnitude of response to the issue?
- What other alternatives should there be?
- Are there inconsistent or incompatible items in the descriptions of the alternatives?

Two alternatives required by NFMA regulations, No Action, and one demonstrating ability to meet the goals of the Resource Planning Act (RPA), were added to the list for consideration at this time. Two additional variations on preliminary alternatives were developed which allowed for departure from long-term sustained yield. Due to significant overlap and duplication, three preliminary alternatives were dropped leaving eight alternatives in the DEIS. In June of 1987 a ninth alternative was included in the array of alternatives in response to decisions made regarding an appeal brought by the Northwest Forest Resources Council. The ninth alternative is referred to as the "No Change" (NC) alternative and is based on the potential yield of the Forest's 1977 Timber Management Plan.

During the review period for the DEIS, many comments were received indicating how well the public felt the key issues were addressed by the alternatives described above. A large number of the commentors expressed the opinion that not all reasonable and viable means of addressing the issues were considered (or at least considered in sufficient detail) in the DEIS. With the comments for direction, the Forest IDT and management team revisited the alternative formulation process used in the development of the DEIS as described previously. The resource options or the management prescriptions and the acre allocations were reviewed and revised. The result of the revisions were three additional alternatives in the FEIS that were not considered in the DEIS.

While developing these additional alternatives, the Forest staff and IDT contacted several groups and individuals that made specific comments concerning alternatives that were not adequately considered in the DEIS. The groups were contacted to clarify their concerns and to help the IDT develop and analyze alternatives that addressed these concerns. Alternative K and Alternative L were developed in this manner. In addition to individual contacts, planning newsletters were sent to all commentors providing them with updates on the development of Alternatives K, L, and W.

The identification of land areas which contribute to the goals and objectives of each alternative was an integral part of alternative development. Working from the management options identified earlier, areas of the Forest were identified as particular MAs and assigned the corresponding management strategy.

MAs are portions of the Forest managed for the same goals and objectives. They are physical units usually delineated on maps, and can be located on the ground. Examples include areas managed to provide specific types of wildlife habitat or particular levels of scenic quality, or intensive timber management. Management strategies (also called management prescriptions) are the direction for activities within MAs, and are detailed in the S&Gs that direct on the ground activities, including rates of timber harvest. A total of 38 management strategies were developed for use in the formulation of benchmarks and alternatives. These combinations of resource objectives were available to be assigned to specific locations on the Forest as necessary to meet the following criteria:

- Cost efficiency,
- Resource trade-offs,
- Resource quality and suitability,
- Planning direction, and
- Resolving issues.

Cost efficiency, which is a requirement of the NFMA regulations (36 CFR 219.12(f)(8)), has been defined as when outputs with assigned dollar values are produced according to their net economic value (i.e., benefits minus costs), or are achieved at specified levels in the least cost manner. For the most part analyses on the Forest consistently show this criterion to be met with the highest level of timber production feasible. Therefore, management strategies were assigned to minimize the impact on the suitable timber land base while still satisfying the other criteria outlined for the alternative.

In some cases resource trade-offs were a factor in addition to the economic trade-offs. Resource quality and suitability were related to the resource trade-offs considered. For example, attributes such as the size of a roadless area or the opportunity for solitude in a roadless area could influence the assignment of a roadless MA. Planning direction influenced MA assignment in some cases, particularly in the No Action and No Change alternatives. Requirements for the No Action and No Change alternatives mandated use of the land allocations in the current Forest Plan (1977) as a guide for MA assignment. Other direction, such as distribution criteria for spotted owl habitat areas, also influenced MA assignments.

The last criterion, issue resolution, had a direct influence on MA assignment in most alternatives. For example, the roadless area issue varies in intensity according to the particular area under consideration. Similarly, scenic corridors along roads are desired to a greater or lesser degree depending upon the emphasis of the alternative.

Data was then assembled and the MA boundaries used for the alternatives were selected. This process combined analysis and judgment to reflect the optimum assignment of MAs and strategies to meet the goals and objectives of the alternatives in both the DEIS and FEIS.

Between the DEIS and the FEIS several of the MAs used to develop the alternatives were also modified. The changes in the MA designations were applied to the alternatives developed since the DEIS

(Alternatives K, L, and W) as well as to the alternatives brought forward from the DEIS (Alternatives NC, A, J, and D). In general, these changes did not affect the goals and objectives of the MAs as described in the DEIS nor the outputs or effects associated with them. The MA changes were described in the section Changes Between Draft and Final.

A complete description of the management strategies for the entire set of MAs used in alternative development can be found in *Comparison of Alternatives, MAs*, later in this Chapter.

The next major phase of alternative development involved selection of silvicultural prescriptions to meet alternative objectives over the Forest and through time. Silvicultural prescriptions represent the potential sets of timber management activities that can be implemented on timber stands of different conditions, including precommercial thinning, fertilizing, commercial thinning and regeneration harvesting. Silvicultural prescriptions are selected in the FORPLAN model, which seeks to schedule activities in a cost-efficient manner. A total of four to eight silvicultural prescriptions were available for selection for each MA, depending upon stand condition. The extent to which FORPLAN selects timber harvest prescriptions determines the timber outputs for each alternative. The role and operation of FORPLAN in alternative development and analysis is described in the following section.

Alternative Analysis

Management prescriptions are sets of activities which represent a specific method of managing particular analysis areas. A group of these prescriptions cover the various ways that different analysis areas can be managed. These prescriptions provide choices which can be made in managing the land. To analyze and present these options, management prescriptions were defined for 15 MAs, each with specific resource objectives. Most analysis areas have the capability to meet the resource objectives of more than one MA. An estimate of economic costs and resource yields associated with the prescriptions was generated for use in the forest planning model (FORPLAN).

Management areas are described in detail at the beginning of Comparison of Alternatives.

Role of FORPLAN

FORPLAN (an acronym for FORest PLANning model) is a linear optimization model that was used to assist in the scheduling of silvicultural prescriptions in order to meet resource and economic objectives; and to assist in the analysis of how well the particular combination of land allocations, management strategies, and silvicultural prescriptions meet the objectives of each benchmark or alternative.

The Willamette FORPLAN model was based on Version 2, with updates designed to assist the interdisciplinary planning team analyze the economic and production trade-offs associated with the recreation, timber, scenery, old-growth, water, roadless, and wildlife resources, and to assist evaluate the extent to which various alternative management scenarios were able to address and resolve the identified public issues.

The FORPLAN model uses analysis areas as the basic building blocks for scheduling silvicultural prescriptions to meet economic and resource objectives. The analysis areas were developed in a two stage process. In the final FORPLAN model areas were first identified with relatively homogeneous characteristics in terms of watershed, silvicultural suitability, timber type (i.e., species group), and timber size class. These delineations were intended to capture the significant social, biological, physical, and economic differences in the way the land responds to alternative management strategies.

The second step was to assign the appropriate management strategy for each analysis area depending on its location, and the resource objectives of a particular benchmark analysis or alternative. A total of 883 preliminary analysis areas were used in the final FORPLAN model. These analysis areas were then combined with the management strategies and processed using a relational data base to reduce the number of unique combinations of analysis areas and management strategies to between 1500 and 2400, depending on the alternative. For a more complete description of the combination collapsing strategies refer to Appendix B.

The scheduling of silvicultural prescriptions is controlled by the management strategy constraints, and the objective function.

Management strategies are represented in the model as constraints on the amount of timber harvest prescriptions which can be selected within analysis areas of a particular MA. For example, where the management strategy is for intensive timber management (such as in the general forest MA), there are no constraints on silvicultural options FORPLAN can choose from. Where the management strategy is to maintain the scenic quality at high levels by retaining the natural appearance of an area (scenic retention MA), the rate of timber harvest allowed within the MA was constrained to less than full yield.

Constraints were applied at two basic levels in FORPLAN. At the broadest level, constraints were applied Forest-wide (e.g., nondeclining yield of timber). At the second level, constraints were applied to a grouping of analysis areas which were included within a particular management strategy. At the third level, constraints were applied to individual analysis areas (e.g., dispersion of timber harvest units). Only the silvicultural prescriptions and timing choices available for a particular analysis area and management strategy could contribute to this type of constraint. FORPLAN could then select and schedule specific silvicultural prescriptions and practices to maximize PNV while meeting all of the objectives for a particular alternative.

In the DEIS FORPLAN model some constraints were applied to specific analysis areas. In the FEIS model the amount of detail included in each analysis area was greatly expanded. Any constraints that may have been applied to a specific analysis area in the DEIS were redesigned to apply to similar grouping of analysis areas in the FEIS.

Constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple-use objectives of a benchmark or alternative. Once the model determined that a feasible solution existed by satisfying all of the constraints, it searched for the set of silvicultural prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

The objective function is a mathematical equation which shows how the Forest's objective (maximize PNV for example) is affected by the values explicitly portrayed in the silvicultural prescriptions available for selection.

Two different objective functions were used to drive the Willamette FORPLAN model, these being to maximize PNV and to maximize timber volume. Although there were some differences in scheduling patterns between the two, both resulted in the model harvesting timber within the limitations imposed by the constraints. All final FORPLAN runs for all the alternatives, except the No Change alternative, were made with a timber volume objective function. FORPLAN was not used to analyze the No Change alternative as it was based on a different set of assumptions and mapping.

Other Analysis Tools

Although FORPLAN was the central model in the analysis process, several other models were essential to either prepare data for FORPLAN, or help interpret FORPLAN results. Construction of managed timber yield tables for use in FORPLAN required use of computerized growth models.

The Douglas-fir Simulator (DFSIM), a growth and yield model, was used to simulate a wide variety of growth and harvest patterns over time for the Douglas-fir and Douglas-fir/true fir managed yield tables (Curtis, 1981). With DFSIM, the user can simulate yield regimes for Douglas-fir under different regeneration options (planted or natural), with or without precommercial thinning (PCT), and with or without fertilization. For a given set of investments, the goal was to find the combination of intermediate harvest and final harvest that best met the objective of maximizing volume or PNV (PNV). To search for the combination of thinnings and final harvest over different rotation ages that best met the objective and constraint set would require a great number of DFSIM runs. Dynamic programming was used in conjunction with DFSIM (DP-DFSIM) to automate the search for yield regimes in DFSIM that optimized either volume or PNV. Yield tables were developed to represent each objective for a range of management intensities from "natural regeneration with no intermediate treatments" to "planting genetically improved stock with full stocking level control plus fertilization."

Managed yield tables for other timber types (true fir and mountain hemlock) were developed with the PROGNOSIS model. PROGNOSIS is similar to DFSIM but does not have the dynamic programming option associated with it.

IMPLAN is a Forest Service designed computer model that estimates the expected economic effects of implementing one or more alternatives. IMPLAN is a computer-based system that is based on economic Input/Output (I/O) models. IMPLAN contains national economic data that have been organized into a single predictive model. The basis for prediction can be any single U.S. county or group of counties, any state or states, or the entire nation. Regardless of how the model is constructed (county or multiples of counties), IMPLAN provides a detailed description of the economy in question. The model then provides analytical information about the industries that are present and their relationship to other industries. Thus, changes in any of the industries, as caused by the alternatives, result in measurable changes in the socioeconomic area of influence. The economic effects estimated with IMPLAN are described by parameters typical of input/output studies. They are structural in nature, permitting multiplier effects to be traced throughout the various regional sectors. Direct, indirect, and induced changes in gross outputs, employment, income, and value added are the most representative account of potential regional economic responses. This information was used to portray the Forest Service's relationship to the area economy and to help assess the effects on that economy of alternative management programs.

Other models were designed to provide input to the FORPLAN model, and to analyze the effects of the alternatives on various resources. The VISPLAN model was used to reduce the complexity of the linear programming task while correctly displaying the effects of timber harvest from the management strategies that were limited to 12% or less final harvest per 10-year period. This model was an integral part of the process used to collapse the number of analysis areas, and is described in Appendix B.

A Spatial Disaggregation Process model was used to determine the acres of timber harvest compatible with meeting resource objectives at the subdrainage scale, and to provide FORPLAN constraints for alternative W, increasing the accuracy of FORPLAN estimates of resource outputs.

An economic spreadsheet was used to fully calculate PNV, costs, benefits, and associated measures such as net cash flow.

A recreation model was developed to calculate the effects of the alternatives on recreation visits in each of the Recreation Opportunity Spectrum Classes. A model was set up to estimate the effects of the alternatives on each of the roadless areas. A model was used to assess the effects of various harvest rates on stream conditions and water quality. Several wildlife models were constructed to further interpret FORPLAN results to estimate effects on animal populations. And a transportation model was used to disaggregate FORPLAN timber volumes to areas served by road systems for estimation of road mileages needed for a particular alternative.

Additional computerized methods were used to assess the effects of alternatives on the major resources. These analysis were based on models which are described in more detail in Appendix B.

Management Requirements

The implementing regulations for the National Forest Management Act contain basic direction for ensuring long term productivity of all forest resources (36 CFR 219.27). To assure consistency in interpreting and applying these requirements in forest planning, Regional direction established those requirements which must be met in all alternatives (internal memos dated 2/9/83, 4/16/84, and 8/4/86). These requirements are known as "management requirements" or MR's. In the DEIS they were called "minimum managemement requirements" (MMRs). All alternatives, except the No Change Alternative, comply with applicable laws and regulations. Additional discussion of the how alternative means of meeting MRs were analyzed is covered in Appendix G.

While numerous laws and regulations direct what must be considered in the planning process, the regulations pursuant to NFMA include detailed direction. Of these, four requirements have been analyzed because of the significant effects they have on management of Forest resources. These are:

- *Water Quality* - "Forest planning shall provide for compliance with the requirements of the Clean Water Act, Safe Drinking Water Act, and all substantive and procedural requirements of Federal, State and local governmental bodies with respect to the provision of public water systems and the disposal of waste water" (36 CFR 219.23(d)).

- *Riparian Areas* - Special attention will be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water...No management practices causing detrimental changes in water temperatures or chemical composition, blockages of water courses, or deposits of sediments shall be permitted within these areas which seriously and adversely affect water conditions or fish habitat" (36 CFR 219.27(e)).

- *Fish and Wildlife* - "Fish and wildlife habitats shall be managed to maintain viable populations of existing native and desired nonnative vertebrate species in the planning area...In order to insure that viable populations will be maintained, habitat must be provided to support, at least, minimum numbers of reproductive individuals and that habitat must be well-distributed so that those individuals can interact with others in the planning area" (36 CFR 219.19).

- *Timber Harvest Dispersion* - When openings are created by the application of even-aged silviculture, individual cuts shall conform to the Regional Guide direction on the dispersion of openings and maximum size limits for areas to be cut in one harvest operation (with some exceptions)(36 CFR 219.27(d)).

Techniques for meeting riparian requirements addressed the need to maintain bank stability and water temperature. The primary methods used were reservation from timber harvest on approximately 20%

of the riparian area which was assessed as inoperable for timber harvest, and reduced harvest rates (extended rotations) on the remaining riparian areas. Another important component of meeting the riparian and water quality requirements are the S&Gs which require implementation of Best Management Practices to control on-the-ground activities. These S&Gs ensure maintenance of viable fish populations including management indicator species of anadromous and resident salmonids.

Wildlife populations were maintained by establishing management indicator species and by providing habitat necessary to ensure continued viability of these species. Dedicated habitats with no timber harvest were provided for the spotted owl, pileated woodpecker, marten, bald eagle, and peregrine falcon. Options were provided for managing marten, pileated woodpecker, and bald eagle habitat. Harvest rotations longer than 150 years were required to provide habitat suitable for reproduction, but younger managed stands would provide habitat for dispersal, roosting, and foraging. Additionally, S&Gs ensure that primary cavity excavator populations will be maintained at or above 20% of biological potential, dead and down woody debris will be maintained in harvested areas, and that unique habitats will be maintained (e.g., cliffs, caves, talus, and meadows).

Timber harvest dispersion was ensured by limiting harvest rates within timber inventory components and within watersheds.

Alternative methods of meeting these requirements were evaluated in the Analysis of the Management Situation (AMS), and in subsequent analysis. During the AMS the impacts of the MRs on timber volume and PNV (PNV) were assessed. Several FORPLAN runs were made with different MR constraints present so that the impacts of the requirements could be determined. These runs evaluated the decreases in volume and PNV as a single MR was added to the base PNV benchmark which had no MR constraints. After the modelling changes for the FEIS were made, the consequences of the MR constraints were again tested. At this stage the effects of the MRs on PNV and timber volume were evaluated by testing how much timber volume and PNV increased as each MR was removed, when compared with a PNV benchmark run which included all the MRs.

Table II-1 shows the results of these runs. Comparisons in this narrative will be in terms of the change in PNV (PNV). Timber volume trade-offs in cubic feet can be determined from the table.

The most significant MR, in terms of effects on PNV, is the spotted owl habitat area requirement (12 % reduction). Riparian area requirements reduce PNV by 3%, mature timber requirements (for the pileated woodpecker and the pine marten) reduce PNV by 3%, and harvest dispersion requirements lower PNV by 6%. The sum of these reductions is 24%. Results of comparisons looking at individual MRs represent the maximum effect of that constraint since the linear program did not have an opportunity to consider any overlapping or interactive effects of more than one MR constraint in its optimization procedures. In the context of a particular alternative, however, the presence of all MR constraints plus additional constraints, allows additional overlapping of constraints and hence lessens the effect of MRs on PNV. Appendix G presents the results of analysis that tests the sensitivity of ASQ and PNV to the management requirements with significant effects.

Table II-1. Minimum Management Requirements - Effects on PNV and Timber Harvest

	LTSY [1]		1st Decade ASQ [1]		PNV [1]		
Description	**MMCF**	**Percent Change**	**MMCF**	**Percent Change**	**$MM**	**Percent Change**	**Comments**
Maximum PNV W/ all MRs	120.2	--	117.3	--	$3,782	--	This benchmark is the basis for comparison.
Dispersion MR	120.4	(+0.2)	119.0	(1.4)	$3,994	(5.6)	Not modeling dispersion allows harvest rates to exceed 25-30 percent of a watershed per decade.
Mature Timber [2]	123.0	(+2.3)	120.5	(2.7)	$3,908	(3.3)	Not modeling this MR adds 18,880 acres to timber production.
Riparian MR	124.0	(+3.2)	121.7	(1.2)	$3,901	(3.1)	Removing this MR adds 11,123 no harvest and 42,742 reduced harvest acres into full yield timber harvest.
Spotted Owl	130.2	(+8.3)	128.2	(9.3)	$4,237	(12.0)	Not modeling this MR adds 70,339 acres to timber production.
TOTAL		(14.0)		(14.6)		(24.0)	
Maximum PNV without MRs[2]	132.5	(N/A)	129.6	(N/A)	$6,073	(N/A)	This data is included as a reference to the DEIS. The percent change information is not valid because many coefficients have changed between the DEIS and FEIS.

[1] These effects are maximum estimates based on benchmarks. Actual opportunity costs are less when MRs are needed in part or totally to meet a resource objective in one or more of the alternatives.
[2] Mature conifer habitat areas for pileated woodpecker and marten.
[3] The maximum PNV without MRs benchmark was not re-calculated using FORPLAN. The information used here is from the DEIS.

Development and Use of Benchmarks

The primary analysis prior to the development of alternatives was the Analysis of the Management Situation (AMS). A comprehensive analysis of resource and economic production capabilities is required in the Analysis of the Management Situation. This was accomplished through individual resource supply and demand assessments, and through FORPLAN computer runs known as benchmarks. The purpose of benchmark analysis was to provide information on:

- The economic implications of complying with legal and policy constraints, including management requirements of 36 CFR 219.27;
- The effects of modeling assumptions;
- The schedule of management activities, resource outputs, effects, costs and PNV (PNV) associated with a single resource or an economic emphasis of individual benchmarks;
- The potential to resolve issues and concerns;
- The need to change current management direction; and
- The range within which integrated alternatives could be developed.

All benchmarks developed in this analysis were designed to be approximately implementable and were not constrained by budgets, except the No Change Benchmark.

All of the benchmarks originally evaluated included provisions to meet the management requirements of 36 CFR 219.27. These included protecting land and resource productivity, meeting air and water quality standards, and maintaining viable populations of fish and wildlife species. The previous section on Management Requirements describes these requirements in detail and presents the opportunity costs of meeting these requirements. Additionally, the results of one benchmark that does not include these provisions is presented in this section.

In addition to the major benchmarks displayed in this section and the analysis of management requirements, analysis was conducted to assess the opportunity costs and resource trade-offs associated with timber harvest policy requirements and economic assumptions. The analysis process and results are explained further in Appendix B. The AMS document, available in the Forest planning records, contains detailed resource supply and demand assessments. Summaries of these assessments are in Chapter III, The Affected Environment.

The analyses described above, in conjunction with the major benchmarks, laid the groundwork for development of the alternatives. The major benchmarks used to facilitate development of DEIS alternative included:

- Minimum Level
- Maximum PNV Based on Established Market Prices
- Maximum PNV Including Assigned Values
- No Action

- Maximum Resource Levels

Changes in FORPLAN model and related yield tables in response to comments on the DEIS would result in different output levels of the major benchmarks. The impact of these changes would be similiar for all benchmarks. The relative effects would be minor. In order to establish a means of estimating the relative affect of the changes on any particular benchmark, the maximum timber and maximum PNV benchmarks were re-analyzed using the FEIS FORPLAN formulation. This revised benchmark analysis can be used to assess the changes in the decision space of the alternatives which can be attributed to changes in the model structure.

A summary of the major results from these benchmarks is contained in Table II-2. A detailed explanation of the benchmarks and the results of the analyses is contained in Appendix B. The analysis of benchmarks provided valuable information about different ways of responding to public issues and management concerns. The maximum and minimum resource levels define the outer bounds, or "decision space," within which integrated alternatives were developed. Relationships among resources and relative trade-offs between resources were also made apparent.

Several of the benchmarks provided the basis for development of a developed alternative as described in the next section, Range of Alternatives.

Table II-2. Outputs, Effects, Activities, and Costs for Benchmarks

Output, Effect, Activity, or Cost	Unit of Measure	Minimum Level	Maximum PNV (Market)[1]	Maximum PNV (Assigned)	Maximum PNV (Assigned) Without MRs	No Action[1]	Maximum Timber[1]	Maximum Recreation
Developed Recreation Use	MRVDs	0	**1,774**	1,774	1,774	***,*****	**1,002**	1,872
Nonwilderness Dispersed Recreation Use								
Semiprimitive Nonmotorized	MRVDs	88	**0**	1	1	**50**	**0**	58
Semiprimitive Motorized	MRVDs	70	**13**	7	7	**49**	**13**	62
Roaded Natural	MRVDs	147	**0**	1	1	**1278**	**0**	686
Roaded Modified	MRVDs	254	**2142**	753	753	**376**	**2142**	340
Wilderness Recreation Use	MRVDs	126	**369**	255	255	**352**	**369**	246
Spotted Owl Habitat Areas	Number	152	**59**	78	16	**59**	**59**	78
Visual Quality Objectives								
Preservation	M Acres	744	**389**	389	389	**547**	**389**	686
Retention	M Acres	308	**0**	0	0	**78**	**0**	402
Partial Retention	M Acres	222	**4**	4	4	**150**	**2**	4
Modification	M Acres	402	**0**	0	0	**5**	**0**	565
Maximum Modification	M Acres	0	**1,283**	1,283	1,283	**895**	**1,285**	15
Allowable Sale Quantity	MMBF	0	**667**	660	746	**608**	**654**	102
Allowable Sale Quantity	MMCF	0	**117**	113	130	**110**	**118**	18
Fuelwood	M Cords	0	**59**	60	69	**54**	**59**	10
Long-Term Sustained Yield **	MMCF	0	**120**	123	133	**113**	**126**	88
Total Budget	Million $	3.7	**61**	41	47	**58**	**63**	10
Returns to Government	Million $	0	**146**	130	150	**120**	**135**	20
Payments to Counties	Million $	0	**37**	33	38	**30**	**34**	5
PNV	Billion $	0.86	**2.38**	5.09	6.07	**3.18**	**3.48**	2.72

[1]This alternative was recalculated using all of the changes in assumptions and data from the FEIS. The mix of DEIS and FEIS benchmarks is intended to help the reader understand changes that have occured since the DEIS was written.

Range of Alternatives

The range of alternatives considered in this FEIS is represented by the seven fully analyzed alternatives which span the range of issues and opportunities identified in the benchmarks analysis, in the DEIS, and in response to comments on the DEIS.
In the FEIS several new alternatives were developed in response to public comments on the DEIS. A large number of the commentors expressed the opinion that not all reasonable and viable means of addressing the issues were considered, and that other combinations of the resource options should be considered. As a result some of the resource options, management prescriptions, or land allocations were revised, and three additional alternatives were considered in the FEIS.

Additional information on the process used to develop the alternatives is found in the section on Development of alternatives in this chapter.

Several of the alternatives are required by regulation, or regional and national direction. The required alternatives and others developed for display in the FEIS are summarized here. Alternatives eliminated from further detail in the FEIS are summarized in the next section.

Required Alternatives

No Change: This is the No Change Alternative required by Regional and National direction in response to decisions made regarding an appeal brought by the Northwest Forest Resources Council. This alternative would: (1) continue the management of the Forest as defined by existing direction in the Forest's Multiple Use Land Management and Timber Management Plan; (2) maintain timber outputs equivalent to the potential yield of the 1977 Timber Management Plan and to the extent possible produce current levels and mixes of other resource outputs; and (3) continue existing policies, standards and management guidelines; although, *it does not incorporate management requirements directed by NFMA.*

Alternative NC is the No Change Alternative.

No Action: This alternative is required by the Council on Environmental Quality (CEQ) regulations for NEPA (40 CFR 1502.14), and by the NFMA regulations (36 CFR 219.12(f)(7)). This alternative would: (1) continue the management of the Forest as defined by existing direction in approved management plans; (2) continue existing policies, standards, and guidelines; (3) update the current budget to reflect changing costs over time; and (4) to the extent possible, produce current levels and mixes of resource outputs. *Management requirements are incorporated in this alternative.*

Alternative A is the No Action Alternative.

Emphasis on the Current RPA Program: This alternative will determine how the timber targets of the current (1980) RPA Program, which were distributed to the Forests through the Regional Guide, can best be achieved.

Alternative B-Departure is the alternative designed to achieve the Forest RPA targets. Alternative B was analyzed in detail in the DEIS. After a review of public comments on the DEIS and consideration of adverse environmental effects of departure alternatives considered in the DEIS, this alternative was not re-analyzed and considered in detail in the FEIS. The analysis and comparisons in Chapters II and IV of the DEIS remain valid and provide information on trade-offs and management implications

of meeting the 1980 RPA timber targets. Other activity and output targets assigned to the Forest in RPA will be achieved in this or one of the other alternatives.

Emphasis on Market Opportunities: This alternative emphasizes resources that have an established market price. Timber production is the major market commodity on the Forest and is emphasized in this alternative. Management for other resources would be at economically and environmentally feasible levels consistent with the emphasis on timber outputs.

Alternative K emphasizes market opportunities on the Forest. In the DEIS, Alternative I was used to display this management option. Because of some similiarities with Alternative K, Alternative I was not considered in detail in the FEIS. See Chapter II of the DEIS for details on output levels and effects of Alternative I.

Emphasis on Nonmarket Opportunities: This alternative puts an emphasis on water, fish and wildlife, recreation, and other amenity values. Management for other resources would be at economically and environmentally feasible levels consistent with the emphasis on amenity values.

Alternative L emphasizes nonmarket opportunities, particularly those related to old-growth preservation, wilderness, dispersed recreation and watershed management. Alternative D provides an emphasis on wildlife values. In the DEIS Alternative C was used to display nonmarket emphasis. Because of similarities with Alternatives D and L, Alternative C was not considered in detail in the FEIS. See Chapter II of DEIS for details on output levels and effects of Alternative C.

Departure Alternatives: In the DEIS, several alternatives incorporated departures from the nondeclining yield policy for timber production. This means that timber harvest schedules were modified to provide more timber in the earlier decades of the planning horizon but less in some of the later periods. The nondeclining yield policy requires harvest levels to remain constant or increase over time.

Two alternatives displayed in the DEIS represented departures from nondeclining yield. As discussed previously, a departure was necessary to meet the RPA timber targets in Alternative B. A departure schedule for Alternative J, the DEIS Preferred Alternative, was also developed to meet the expected future needs of the local timber industry as reflected in the Forestry Program for Oregon and supplemented by additional information from the State Department of Forestry. Alternative J-Departure also analyzed the effects of a departure on forest age-class distribution and possible benefits to other multiple use objectives.

Alternative J-Departure was not re-analyzed and consider in detail in the FEIS because public comments indicated it was not a desireable option for addressing timber supply concerns and that the environmental effects of the accelerated harvest were adverse and did not address other resource concerns. A departure of Alternative W, the FEIS Preferred Alternative, was not considered in the FEIS. Based on a comparison of issues addressed in Alternative J and W, and the effects of Alternative J-Departure displayed in the DEIS, the IDT determined that a departure sale schedule could not be developed for Alternative W that would attain the overall multiple use objectives of the alternative.

Additional harvest scheduling options were also considered for Alternative J in the DEIS that would allow for a smooth transition from current timber program levels to those proposed in the DEIS. These options were not displayed or re-analyzed in the FEIS.

All of the alternatives analyzed in the DEIS as well as the 3 additional alternatives developed for the FEIS in response to public comment were considered by the IDT to evaluate the range of alternatives. These 12 alternatives were evaluated to see how well they were distributed between the maximum

and minimum potentials for resources, if they provided an adequate comparison of resource trade-offs and if they were responsive to public issues and management concerns. As a result of this evaluation, the group of 12 alternatives was reduced to seven because of significant overlaps in one or more resource issues. The IDT also felt that the smaller set of alternatives would provided the FEIS reader with a clearer understanding of the resource issues and trade-offs involved.

Other Alternatives

Additional alternatives were developed by the Forest in response to public issues and management concerns. These also respond to National Forest Management Act Regulations (36 CFR 219.12(f)(1)) which requires that alternatives "be distributed between the minimum resource potential and the maximum resource potential" (the decision space) in order to display the full range of resource outputs that can be produced. Alternatives D, J and W are analysed in this FEIS to provide a wide range of alternatives, and to represent different balances between amenity and commodity oriented issues.

Decision Space

The alternatives developed, except the No Change Alternative, for management of the Forest are designed to be fully implementable under the NFMA Regulations, and focus on the resolution of the identified public issues and management concerns. The limits and reference points identified in the benchmark analyses were used in constructing these alternatives.

The selected harvest system for alternatives in most areas is clear-cutting. In areas managed for scenic retention, partial retention, dispersed, motorized, and nonmotorized recreation both clear-cutting and uneven managed age harvest systems will be used.

In all alternatives the use of herbicides will follow the direction established in the selected alternative of the 1988 EIS on "Managing Competing and Unwanted Vegetation." and the mediated settlement.

All alternative have incorporated the S&Gs from the Regional Guide and the SEIS for spotted owls except the No Change Alternative.

All alternatives include mitigation as described in the following section on features common to all alternatives.

These alternatives assume that there are no budget constraints which result in foregoing economically efficient commodity production opportunities or stated mitigations.

Preferred Alternative

A Preferred Alternative has been identified from the array of alternatives presented in this FEIS. The Preferred Alternative and proposed action in this FEIS is Alternative W.

The Preferred Alternative has been identified after a comparison of the alternatives and consideration of their resource outputs, environmental consequences, implementation costs, and net public benefit.

Alternative W provides direction for management of the Forest to provide a sustainable level of commodity resources, while providing for a wide range of non-commodity uses of the Forest. Wildlife habitats for mature conifer management indicator species will be managed at minimum levels. River and stream corridors will be managed primarily to provide water quality, fish habitat, dispersal of interior wildlife species, and high quality recreation opportunities. Alternative W includes principles of maintaining

old-growth characteristics in areas managed for scenic retention and partial retention, and encourages the use of minimum fragmentation in timber sale design.

Alternative W was developed without budget constraints. The resource activities, effects and outputs displayed in a later section of this chapter, are based on the budget level which is also displayed. The effect of budget constraints on this alternative would vary according to if the constraint was applied uniformly across market and non-market resources or not. Budget constraints might reduce the level of market outputs, increase the effects of timber harvest on non-market resources, and reduce monitoring of the S&Gs.

Alternatives Eliminated from Detailed Study

This section presents alternatives which were considered, but subsequently eliminated from detailed study. This group of alternatives includes benchmarks, preliminary alternatives developed for the DEIS and several alternatives that were considered in detail in the DEIS but were eliminated from detailed study in the FEIS based on public comment on the DEIS and a reevaluation of how the alternatives considered addressed issues, concerns and opportunities.

Benchmarks

Benchmarks were developed as part of the Analysis of the Management Situation (AMS) and were designed to emphasize the production of individual resources, or to define the most cost-efficient combination of prescriptions and land allocations for management of the Forest under certain circumstances. Benchmarks serve as reference points for the purposes of defining the range within which integrated alternatives were developed (the decision space), and for estimating the effects of various objectives and assumptions.

All of the benchmarks discussed in Development and Use of Benchamrks were considered for use as alternatives. However, all but one were eliminated from detailed study. The No Action benchmark became Alternative A, the No Action Alternative. Although the other benchmarks were eliminated from further consideration for a variety of reasons, they were useful as starting points for development of particular alternatives. The minimum level and the maximum PNV benchmarks were used to assess economic efficiency and to determine the economic implications of various harvest scheduling options. The benchmarks to maximize timber and recreation helped to determine objective levels for these resources in various alternatives.

A variation of the No Action benchmark (No Action/Without MMRs) was developed to assess the ability of the Forest to produce goods and services under the land allocations and prescriptions contained in the 1977 Forest Land Management Plan, without including the management requirements of NFMA. Although all resources are addressed in the current plan, the lack of management requirements in this benchmark is contrary to existing law. This benchmark became the No Change alternative.

Other DEIS Alternatives

Several preliminary alternatives were developed for the DEIS to respond to a specific issue or to help provide a wide range of alternatives. These alternatives were developed to varying degrees ranging from formulating a general goal or theme, through analysis of FORPLAN results, but were not presented in detail in the DEIS.

An alternative was developed to provide timber volumes over the first 5 decades that would maintain a steady supply from all ownerships within the three-county area. Achieving this objective required a departure timber sale schedule for the Forest with volumes rising for the first 2 decades and then declining slightly in decades 3 through 5. This alternative was in response to concerns for a Forest timber sale level that would balance timber harvest from all ownerships to provide a stable supply of raw materials for the wood products industry. See Chapter III, Timber for further information on the projected timber supply from other than Forest lands. This alternative was eliminated from detailed study because other departure alternatives considered in detail addressed similiar concerns based on input from the State Department of Forestry through the Forestry Program for Oregon and the 1980 Resource Planning Assessment timber targets.

Another alternative considered, but not studied in detail in the DEIS had an objective to maximize timber management on the suitable timbered land remaining after most of the inventoried roadless lands were allocated to no-harvest allocations. A FORPLAN analysis of this alternative produced an ASQ of 97 MMCF (565 MMBF) annually on a suitable landbase of about 807,400 acres. Like the benchmarks, this information provided a reference point for considering the roadless and timber supply issues, but was not useful as an alternative since it did not adequately deal with many of the major issues on the Forest.

Several preliminary alternatives developed by the Forest for the DEIS, were designed to ensure that all of the issues were being addressed over a broad range of land allocations and management practices. Further evaluation of the entire set of alternatives indicated that several were redundant, did not propose significantly different ways of addressing key issues, and thus were subsequently dropped from further consideration in the DEIS.

During the development of alternatives for the DEIS, several public interest groups developed management proposals for specific areas of the Forest. Rather than develop these proposals as individual Forest-wide alternatives, they were incorporated into Forest-wide alternatives with compatible goals and objectives. The management proposals included in other alternatives involve the Three Creeks, South Fork McKenzie, Fall Creek, and Hardesty Mountain areas of the Forest.

During the development of alternatives for the DEIS, the Oregon Natural Resources Council (ONRC) submitted an alternative that they proposed be considered in detail in the DEIS. After a preliminary analysis of the alternative by the Forest IDT it was dropped from further detailed analysis and consideration. The reasons for not considering the alternative in detail in the DEIS were that it was judged to be outside the range of reasonable alternatives because it did not adequately address key issues such as timber harvests, many of the land allocations proposed in the ONRC alternative were included in other alternatives that were considered in detail, and recommendations within the proposal for additional wilderness designations were not consistent with the direction in the Oregon Wilderness Act of 1984. See Chapter II, Alternatives Considered But Eliminated From Detailed Study, ONRC alternative in the DEIS for further information on analysis and rationale for eliminating this alternative.

Based on comments received during the public review of the DEIS, the Forest reconsidered the rationale for excluding this alternative. After several meetings with ONRC to identify objectives of the alternative (including several modifications of the original ONRC proposal), the Forest developed an alternative in response to their input. Alternative L was the result of this effort and has been analyzed in detail in the FEIS. See the appropriate sections of Chapters II and IV of the FEIS for a complete description, display of outputs and discussion of the environmental effects of Alternative L.

Other Alternatives - FEIS

In response to public review of the DEIS, many comments spoke to alternatives that were either considered or not considered in the DEIS and how well the options for resolving key issues were addressed. In response to the public comments, three new alternatives were developed and considered in detail in the FEIS; Alternative K (developed with input from Willamette Forestry Council (WFC)), Alternative L (developed with input from ONRC), and Alternative W (developed by Forest in response to public comments on Alternative J). See appropriate sections of Chapters II and IV in FEIS for further information on these alternatives.

When these 3 new alternatives were added to the group of alternatives considered in detail in the DEIS, the overall range of responses to issues was similiar to the DEIS. Several of the alternatives considered in the DEIS did not significantly add to the range or were similiar in many respects to the new alternatives. As a result, the following alternatives were not reconsidered in detail in the FEIS; Alternative B-Departure, Alternative C, Alternative F and Alternative I.

Following is a brief summary of the goals and objectives considered in these alternatives. For a more thorough discussion, see Chapter II, Description of Alternatives in the DEIS.

Alternative B-Departure (RPA) The goal of this alternative is to meet the 1980 Resources Planning Act (RPA) Program timber production targets assigned to the Forest in the Regional Guide. Other activity and output targets assigned to the Forest in RPA will be achieved in this or one of the other alternatives.

The level of timber production assigned to the Forest in RPA averages approximately 870 million board feet annually for the 50 year planning period. This volume includes all merchantable timber sold by the forest. Translated in terms of allowable sale quantity (ASQ), or net green volume, the RPA target equals 695 million board feet (128 million cubic feet). This volume is higher than the maximum amount that can be produced on a sustained basis.

The land allocations and acres suitable for timber management in this alternative were similiar to Alternative I in the DEIS. Fish, wildlife, soil and water resources were managed to met management requirements as modelled in the DEIS. The ASQ of Alternative B was 715 MMBF, slightly above the the 1980 RPA target of 695 MMBF. Alternative I, with a nondeparture sale schedule and identical suitable land base had an ASQ of 619 MMBF, several million board feet below the RPA target. Alternative B addressed the major issue of timber supply and demonstrated the effects of meeting the 1980 RPA timber targets. Because of public comment on departures, failure to address other key issues, and overall adverse environmental effects, an alternative designed specifically to meet the RPA timber targets is not considered in detail in the FEIS.

Alternative C - Alternative C emphasized recreation, fish, wildlife, and maintenance of the natural attributes of the Forest. It is designed to provide high levels of recreation opportunities and high quality experiences. The full inventory of roadless areas is maintained in an undeveloped condition with an emphasis on semiprimitive nonmotorized activities. Future demand for developed recreation opportunities would be met. Opportunities for high quality Wilderness experiences would be provided by regulating use. An additional Wilderness is proposed.

All areas of special significance would be managed to protect and enhance desirable attributes. Scenery would be enhanced by managing all areas according to inventoried Visual Quality Objectives and by rehabilitating unacceptable modifications.

The quantity, quality, and diversity of plant and animal habitats would be maintained at high levels. Habitat would be provided for the full inventory of spotted owls. A large variety of allocations are used to protect the soil, water, and air resources of the Forest, well above the Management Requirements, and to retain large amounts of old-growth.

Timber management would be emphasized to the degree compatible with other resource objectives.

This alternative was not analyzed in the FEIS because it was adequately represented by the range of alternatives which were fully analyzed.

Alternative F - Alternative F emphasized a balance of timber production and amenity uses such that historic harvest levels (average of 607 MMBF annually, Timber Sale Program Quantity) are maintained to support the traditional economic base of local communities. Amenity resources would generally be provided at the highest level commensurate with meeting the timber volume objective.

Approximately 41% of the currently unroaded areas would be maintained in a roadless condition to provide semiprimitive recreation opportunities and retain old-growth. Additional old-growth would be maintained to accommodate 74% of inventoried spotted owl habitat areas. Scenery along roads, trails, and attractions would be managed at current levels.

Some user regulation would occur in Wilderness to provide a better experience and help maintain the resource. Additional developed recreation opportunities and service would be provided. Areas currently receiving special area designation would be protected. A moderate emphasis would be placed on soil and water improvements, and fish and wildlife habitat improvements. Fish and wildlife habitat, as well as soil and water resources, would be managed above Management Requirements.

This alternative was not analyzed in the FEIS because it was adequately represented by the range of alternatives which were fully analyzed.

Alternative I - Alternative I emphasized the production of timber. Most of the suitable timber land base is allocated to timber production. Less than 6% of the currently inventoried roadless lands would be kept undeveloped. Old-growth would be retained for wildlife Management Requirements, in areas where roadless recreation opportunities exist, and in timber production areas prior to initial harvest.

Developed recreation opportunities would be limited to sites currently receiving high use. Some protection of the visual resource would occur along major highway corridors. Fish and wildlife habitats, and soil and water resources would be managed to meet Management Requirements. A few areas of special significance would be managed as Special Interest Areas.

Even though these alternatives were not re-analyzed in the FEIS, the relative comparisons of outputs and environmental effects in Chapters II and IV of the DEIS are still valid and were useful in considering the range of options that exist for addressing key Forest issues.

The departure scenario for Alternative J, the Preferred Alternative in the DEIS, also was not considered in detail in the FEIS. There were few comments on this alternative from the public review and many of the comments that were received expressed reservations about the level of environmental impacts associated with a departure. A review of the environmental effects of the departure alternatives considered in the DEIS, Alternative J - Dep. and Alternative B, did indicate generally higher levels of adverse effects in comparison to the other alternatives. See Chapter IV, DEIS for further information. Because of the high level of environmental effects and relative low level of public input for depatures

as a means of addressing the timber supply issue, no departure alternatives were analyzed in detail in the FEIS. See Chapter II of DEIS for discussion of departure opportunities and effects on timber supply.

In addition to the WFC and ONRC input between the DEIS and FEIS on specific alternative proposals, the Sierra Club also proposed an alternative for the Forest. The objectives of the Sierra Club Family Multiple-Use Alternative were to:

- Maintain approximately 60,000 additional acres in roadless condition (as compared to Alternative J).

- Protect all of the remaining "Classic" and "Early Classic" old-growth that was in a timber harvest category in Alternative J. The best available estimate is 126,000 acres which would be removed from timber harvest.

- Minimize further fragmentation of the Forest by using a "triage" concept to identify areas already highly fragmented from those with more coniguity. Harvest opportunities would be emphasized in the fragmented areas.

- Provide a level of timber supply near the historical harvest level for the past 10 years or approximately 520 MMBF.

A preliminary analysis indicated that the timber harvest objective and the roadless and old-growth objectives could not be met simultaneously. Comparisons with DEIS data for Alternative J show an ASQ of about 440 MMBF for the proposed land allocations. Additional analysis of Alternative J and other alternatives for the FEIS indicate that a detailed analysis using the FEIS FORPLAN model would likely result in an even lower ASQ projection. A detailed analysis of the Sierra Club proposal would also be difficult due to lack of a common map to indicate where and more precisely how many "classic" and "early classic" old-growth stands were to be protected. The preliminary analysis was done by correlating narrative descriptions with available Forest data to the extent possible, but mapped information would be necessary for further analysis.

The Sierra Club alternative was not considered in detail in the FEIS for the following reasons:

- Many of the resource objectives proposed were similiar to or were included in other alternatives considered in detail; roadless recommendations - Alternatives D, and L; old-growth - Alternatives D and L; fragmentation - Alternative W; timber supply - Alternative W.

- The "triage" concept failed to produce enough additional timber harvest on the acres identified for high intensity timber management primarily because meeting management requirements for other resources such as wildlife, water and soils did not allow large increases in harvests from these areas. Without the ability of these areas to compensate for decreases due to additional roadless and old-growth protection, the objectives stated for the alternative were not possible.

ALTERNATIVES CONSIDERED IN DETAIL

Introduction

Seven alternatives are considered in detail, Alternatives NC, A, D, J, L, K, and W. These offer various views as to how the land and resources of the Forest could be managed. Each is a combination of land allocations, management practices, and activity schedules which, when implemented, would result in a unique combination of resource outputs and environmental consequences. Together, they present a broad range of possible management alternatives.

The significant land uses, environmental effects, and resource levels are presented by alternative and time period in later sections of this chapter. Chapter IV, Environmental Consequences, describes the causes and relationships of the resource levels and environmental effects in detail.

Features Common to All Alternatives

In this section the features common to all alternatives are described. These features are goals and program levels which are found in all alternatives; inventories and assumptions used in modelling; and mitigation measures which are required to meet Management Requirements. Features which are not included in the No Change Alternative are noted below.

Management activities in each alternative are subject to S&Gs needed to attain the objectives and desired future condition for the Forest and for specific MAs. These standards are often required to mitigate the effects of management activities. S&Gs common to all alternatives (except No Change) are included in Appendix D. Additional S&Gs which apply to the Preferred Alternative are included in the Forest Plan which accompanies this FEIS. Some of these S&Gs are adopted from the Regional Guide for the Pacific Northwest Region, and others were developed by the interdisciplinary team specifically to respond to conditions on the Forest. Mitigation measures listed below are representative of the major types of mitigation found in all of the alternatives. The degree to which they are implemented varies according to the goals and objectives of each alternative, and in accordance with specific site characteristics. In all cases, mitigation measures would be designed at the project level during plan implementation, to fit the site.

Mitigation measures serve to accomplish the following:

- Avoiding impact of an activity altogether by not taking a certain action or parts of an action,
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation,
- Rectifying the impact by repairing, rehabilitating or restoring the affected environment,
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action,
- Compensating for the impact by replacing or providing substitute resources or environments.

Timber

With the exception of the No Change Alternative, current information is used including the most recent timber inventory data and yield tables.

Areas which cannot be adequately restocked within 5 years, or with active land slides or risk of irreversible damage to soil and water resources, would be designated as unsuitable for timber production, and would have no programmed timber harvest.

The final determination of timber harvest method would be made on a site-specific level for each project. All alternatives would employ combinations of the silvicultural systems applicable on this Forest. Even-aged and uneven-aged systems, including clearcut, shelterwood, seed tree, single tree selection and group selection harvest methods are all available tools under each alternative. The S&Gs indicate the system generally appropriate for given combinations of site and stand conditions, and management goals and objectives. The FEIS, Appendix F presents a discussion of the various systems, comparisons of their effects, and rationale for uses under different conditions. The final selection of a silvicultural system for a specific site would be left for the silvicultural prescription. This is consistent with the Criterion 6 of Section I-1 of the S&Gs in the Regional Guide for the Pacific Northwest Region. (USDA 1984b).

Logging systems would also be matched to the site specific conditions, with systems selected to meet the resource objectives at the least cost. All systems would be available, including helicopter, and would be used where appropriate. The cost data used in the analysis includes allowances for this mix of logging systems in the timber program. Timber management intensities, which define the levels of practices such as fertilization, precommercial and commercial thinning, etc., were developed to portray different investment levels.

Pest Management

An integrated approach to pest management would be employed that incorporates the Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation. In implementing the Forest Plan through project activities, the Forest would comply with the Record of Decision issued by the Regional Forester dated December 8, 1988, and the Mediated Agreement of May, 1989. Use of all vegetation management techniques is allowed only when other methods are ineffective or would unreasonably increase project costs. Emphasis must be on prevention and early treatment of unwanted vegetation and full public involvement in all aspects of project planning and implementation. Monitoring and enforcement plans to implement specific methods would be developed for site-specific projects and described in the environmental analyses for these projects.

Wildlife

At least two potential nest sites would be managed to meet management requirements and the Pacific States Peregrine Falcon Recovery Plan.

All active bald eagle nest sites would be protected. Additional potential nest sites would be protected to meet the management requirement of 21 active and potential nest areas.

Except for the No Change Alternative, all of the S&Gs concerning Spotted Owl Habitat Areas are based on the direction in the Regional Guide. The Pacific Northwest Region's Final Supplemental Environmental Impact Statement (SEIS) considers a range of alternatives for spotted owl habitat management. The Preferred Alternative in the Final SEIS changed direction for spotted owl habitat management from that described in the Regional Guide. Appendix G displays the potential effects of this change on some of the alternatives described in this chapter.

Many mitigation measures are designed to maintain wildlife habitat. Some roads would be closed to protect threatened and endangered species habitat during critical periods such as the nesting and

breeding season for bald eagles. Access would be controlled to increase habitat effectiveness for deer and elk. The amount of roads with limited entry depend on the elk habitat objectives for the area. Dead, down and defective trees would be protected to meet or exceed management requirement habitat for primary cavity excavator species of birds. Habitat manipulation projects would be undertaken to improve habitat or mitigate habitat loss for wildlife species.

Fish

Increasing the passage of anadromous fish around reservoirs on and adjacent to the Forest would be encouraged by working in partnership with other Agencies, and the public. Rehabilitation and enhancement projects for anadromous fish habitat would be implemented where compatible with other land allocations. Fish population management objectives would be compatible with fish management goals of Oregon Department of Fish and Wildlife, and the Northwest Power Planning Council.

Riparian areas and fish habitat would be protected through mitigation measures which prevent disturbance to streams during spawning seasons, require directional felling of harvested timber, and suspension over stream channels during yarding. When catastrophic events occur, or when preventive measures are insufficient, riparian areas would be rehabilitated by planting grass and tree species with rapid growth characteristics, and by introducing boulders, gabions, or large woody debris.

High quality habitat would be provided for the Oregon Willamette Chub at Buckhead Wildlife Area and Shady Dell campground.

Soil and Water

Management activities in all alternatives would be governed by those S&Gs which include Best Management Practices (BMPs). BMPs are specifically designed to protect water quality, as required by Section 208 of the Clean Water Act. General BMPs would be selected and tailored for site-specific conditions to arrive at project-level BMPs for the protection of water quality. Best Management Practices used on the Forest would meet or exceed BMPs described by the Oregon Forest Practices Act. See BMP Appendix H for a discussion of the process and practices.

Many BMPs are routinely built into ground or vegetation disturbing projects (e.g., timber sales) in order to mitigate adverse effects on soil productivity and water quality. Preventative practices such as log yarding with the entire log or one end-suspended, and burning slash when soil and duff moisture contents are high, have been found to minimize soil erosion and productivity losses. Road construction, reconstruction, and maintenance practices also receive focused attention in project level planning and execution. Road drainage techniques, culvert design, and stream crossing structures are all designed to mitigate the impacts of the Forest road system.

The risk of adverse cumulative effects to water quality vary according to the effectiveness of the selected BMP's and the rates of timber harvest and road construction in subdrainages.

Wetlands and floodplains would be protected according to Executive Order 11990 and E.O.11988. The requirements of the Clean Water Act would also direct the management of wetlands.

Long term soil productivity would be maintained by implementing practices to maintain soil condition. Cost effective soil and water enhancement projects would be undertaken where compatible with other resource goals.

Wild and Scenic Rivers

Except for the No Change Alternative, all of the Alternatives provide for protection of outstandingly remarkable values of 2 designated Wild and Scenic study rivers and portions of 8 rivers determined eligibible for inclusion in the National Wild and Scenic Rivers system. Protection of river values for designated study and eligible rivers is afforded these rivers pending Congressional action or until river segments are determined unsuitable for inclusion into the National System.

Fire and Fuels

A full fire prevention program would be implemented. Three to five lookouts would be staffed. Aerial detection would be provided, as necessary and where cost-effective, after lightning storms and on high risk days. An initial attack program which emphasizes cost-effective presuppression and suppression, while minimizing resource loss would be provided.

Logging residue would be utilized for multiple purposes including nutrient recycling, wildlife habitat, fuelwood, and other commercial products, while achieving reforestation and air quality objectives. Prescribed burning would be limited to times and sites which do not impact high use areas of the Forest and nearby population centers.

The Forest would comply with daily smoke management instructions from the State Forestry Office to mitigate air quality impacts from slash burning. These instructions specify where and when burning is allowed. Other air quality mitigation measures include early and aggressive fire mop-up, increased utilization of logging residue, and public education.

Cultural Resources

Cultural resource management would be accomplished in accordance with appropriate laws, regulations, and policies for both historic and prehistoric properties, and to ensure the rights of Native Americans to practice their traditional religions.

Minerals and Energy

The amount of land available for entry by mineral and energy development would be directly related to the total acres of land in allocations which permit this activity. All energy related applications, notices of intent, or operating plans for locatable minerals would be responded to in a timely manner. Active permits and claims would be administered to established standards to minimize adverse impacts to surface resources. All anticipated major energy projects, mining opportunities and leases, and claims with potential for development would be identified.

Facilities

Utility transmission corridors are excluded from crossing the crest of the Cascades along much of the eastern boundary of the Forest because of designated Wilderness. There are five areas on the crest that are not Wilderness and which are therefore "windows" through which utility transmission corridors could possibly pass. These windows are the areas in the vicinity of Emigrant Pass, Willamette Pass, McKenzie Pass, Santiam Pass, and the North Fork of the Breitenbush River.

A number of avoidance areas would be important considerations in the evaluation of corridors through these windows. These considerations include scenic values, wildlife habitat requirements, and needs and values associated with developed downhill and cross-country ski areas.

If the need arises for utility transmission corridors on the Forest, their establishment and location would be determined through an evaluation of alternatives (including existing corridors), utilizing a project environmental analysis (NEPA) process, with inter-Forest and interagency coordination and involvement.

Roads

The miles of road constructed during the next decade would be in response to needs of the timber sale program for each alternative. Management of existing roads would be responsive to the management objectives of resources appropriate to the MA and alternative.

Lands

All existing special use permits would be administered to established standards. Necessary landline location would be done to support all resource programs. Investments in permanent markers would be maintained. Rights-of-way necessary to support revenue producing resources would be acquired. The desired land ownership pattern in the Forest Plan would be achieved with methods other than purchase.

Law Enforcement

A Forest Service law enforcement agent would make regular patrols in all areas of the Forest. Cases with some possibility of recovering costs would be investigated. Cooperative law enforcement agreements would provide regular weekend and holiday patrols at fee sites and other high use areas from the beginning of fishing season through the month of September. An aggressive cannabis (Marijuana) eradication program would also be maintained.

Firewood

The number of personal use firewood permits issued, amount available per permit, and cost of each would be evaluated and adjusted yearly, based on demand and the cost of administering the program. Firewood cutting areas would also be determined on an annual basis.

H.J. Andrews Experimental Forest

The H.J. Andrews Experimental Forest would be managed for research, according to the objectives of the coordinating agreement between the Pacific Northwest Research Station and the Forest.

Alternative Goals And Management Objectives

This section presents the goals and objectives of the seven alternatives.

Each alternative has a set of goals and output objectives. These are designed to respond to public issues and management concerns identified in Chapter I and Appendix A. Each alternative distributes the lands of the Forest to different MAs. Acreages assigned to different MAs vary from one alternative to another (Table II-3), Comparison of Alternatives). Locations of the MAs for each alternative are displayed on the maps which accompany this document. Descriptions of the MAs are presented in Comparison of Alternatives section in this Chapter.

ALTERNATIVE NC (No Change)

Goals and Background - The No Change (NC) Alternative represents implementation of the Forest's existing Land Management and Timber Management Plan to achieve timber production at potential yield levels.

The No Change Alternative has been developed in response to decisions made regarding Appeal Number 1588, brought by the Northwest Forest Resources Council on May 19, 1986. The appeal centered on a decision by Regional Forester James F. Torrence to "require inclusion of Minimum Management Requirements (MMRs) in the No Action Alternative for each Forest Plan." The substance of the appeal was that a "true No Action Alternative representing current management plans" was not included in the DEIS and is not included in the FEIS. In response to this, a No Change Alternative has been developed to represent the existing timber management plan, and consequently does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture to implement NFMA.

The following provisions of NFMA or other laws or regulations are not partially or fully complied with in the current management plan represented by the No Change Alternative:

> 36 CFR 219.14 - Timber resource land suitability: requires identification of lands not suited for timber production based on risk of irreversible resource damage, lack of assurance of reforestation within five years, or withdrawal by Act of Congress, Secretary of Agriculture, or Chief of Forest Service.
>
> 36 CFR 219.16 - Requires that all alternatives identify decadal timber harvest levels and long-term sustained yield levels, consistent with the requirements of the RPA program and Regional guide. Also specifies conditions under which departure from nondeclining flow will be considered.
>
> 36 CFR 219.18 - Requires that Wilderness management direction be provided, including actions needed to limit or distribute visitor use, and measures desirable to protect the Wilderness or adjacent areas from wildfire, insects or disease.
>
> 36 CFR 219.19 - Provides for viable populations of vertebrate wildlife species, the selection and monitoring of management indicator species, cooperation with wildlife management agencies, and protection of habitat critical to threatened or endangered species.
>
> 36 CFR 219.23 - Requires full consideration of water and soil resources including estimates of current water uses, instream flow requirements, protection of water quality, watershed condition, and protection of wetland and floodplain values.
>
> 36 CFR 219.27 - Identifies specific management requirements to be used in the development, analysis, approval, implementation, monitoring and evaluation of forest plans for activities including: silvicultural practices, resource protection, vegetative manipulation, protection of riparian areas, protection of soil and water, and maintenance of diversity.

The Multiple-Use Land and Timber Management Plan upon which the No Change Alternative is based was developed in 1977. The original plan was based on yield tables and resource relationships which do not reflect the latest scientific techniques and information and do not reflect the standards in the NFMA regulations. The timber management plan has been amended following Congressional designa-

tions (new Wilderness and Wilderness additions), but there has not been reconciliation of the timber management plan with unit plan direction and requirements of NFMA.

The difference in assumptions between the No Change Alternative and the other alternatives is of a magnitude such that some activities, costs, outputs, and effects could not be reasonably estimated or compared to other alternatives. These different assumptions include the following:

- Alternative NC includes 125,000 acres of "marginal" lands programmed at full yield. This results in a suited landbase of 1,064,616 acres. About 60% of the lands in the marginal category are considered unsuited by today's standards. The current plan proposed program recognized the difficulty of managing these lands by scheduling only 7% of the potential harvest on marginal soils, to provide research on management practices.

- Management Requirements are not provided in the No Change Alternative. The most significant requirements included in all other alternatives are providing for maintenance of viable fish and wildlife populations, and dispersion of timber harvest units.

- Timber yields were developed from a different timber inventory, used different growth and yield models, and were based on a different grouping of species and site indices. Fertilization was not included in yield tables for the No Change Alternative.

- Alternative NC uses commercial thinning volume to offset the shortage of mature timber available for harvest in the 6th and 8th decades. As many as six thinnings, spaced ten years apart, are prescribed for some stands with the total yield from commercial thinning accounting for half or more of the volume, thus allowing harvest levels to be maintained at the long term sustained yield capacity.

- Multiple resource objectives were not directly represented in the model used to calculate the potential yield for Alternative NC; areas like streamside zones and scenic corridors had reduced yields to represent these objectives.

These differences prevented use of the current Forest FORPLAN model to evaluate the No Change Alternative.

Recreation - The current mix of public and private sector management of developed sites would remain unchanged. A 108-day managed season for developed facilities would be in effect.

Semiprimitive motorized and nonmotorized dispersed recreation opportunities would be provided from several land allocations including the Waldo Lake Recreation Area and the Oregon Cascades Recreation Area (OCRA). The OCRA is managed to provide motorized use opportunities throughout the year.

Seventy percent of the Forest would be open to off-road vehicles (ORVs); 30% would be either closed or restricted to a specified season of use and/or type of vehicle.

Existing nonwilderness trails, totaling 714 miles, would be retained in this alternative; periodic trail reconstruction and regular maintenance would be done to keep the entire trail system to standard.

Increases in future use of Wilderness would be allowed up to user capacity of each Wilderness Resource Spectrum class MA. Trail maintenance, and resource protection and rehabilitation measures would be employed routinely. No additional trails would be constructed.

Nomination of sites to the National Register of Historic Places would be performed as necessary.

The natural and cultural characteristics of four areas (1,813 acres) in the Forest would be preserved as Special Interest Areas (SIAs) in this alternative. These are Monument Peak Botanical Area, Wolf Rock Geological Area, Lamb Butte Scenic Area, and Tumblebug Gorge Geological Area. In addition, this alternative designates 22 specimen old-growth timber groves, totaling 1,237 acres, to provide for recreational use, educational study, and aesthetic appreciation.

Roadless Lands - This alternative would maintain significant portions of 8 inventoried roadless areas and lesser amounts of other inventoried roadless areas in an undeveloped condition. The majority of the Mt. Hagan roadless area would be allocated to multiple-use management, including a Research Natural Area and timber harvest.

Visual Resources - This alternative emphasizes a high to moderate level of scenic quality within foreground zones of all State and Federal highways. The overall scenic quality of Forest viewshed corridors, however, would have a low to moderate emphasis in this alternative.

The foreground areas of all State and Federal highways, selected major Forest roads, and selected trails would be managed to ensure that landscape alterations are not evident from within the area (Visual Quality Objective (VQO) of Retention). In addition, the foreground areas of selected Forest roads and trails are managed to ensure that changes, while noticeable, remain subordinate to the character of the surrounding landscape (VQO of Partial Retention).

Portions of middleground view areas from State Highway 22 and State Highway 126 and from selected Forest roads, are managed to provide a landscape scene where alterations are subordinate to the character of the surrounding area (VQO of Partial Retention).

Old Growth - A minimum of approximately 260,000 acres of old growth (R-6 definition) would be maintained after fifty years in this alternative. These acres are in areas administratively and legislatively removed from development and lands unsuited for timber production. Additional old growth would be present in timber production areas for several decades.

Timber - Timber harvest would be scheduled on a suited landbase of 1,064,600 acres. Approximately 918,700 acres would be managed on rotations of less than 100 years, and 145,900 acres on rotation ages of 100 to 200 years. The Allowable Sale Quantity (ASQ) of 810 MMBF for the 1st decade would be about 30% higher than the average amount sold annually between 1977 and 1989.

Wildlife - Forest-wide, optimal thermal cover would be provided on at least a portion of deer and elk winter range during the first decade. Habitat capability would be provided for a potential population of 3720 elk and 18,600 deer for the first decade. This is the estimated existing population levels.

Twenty-one bald eagle sites would be provided including five active nest sites.

Natural openings would be maintained or enhanced whenever possible. Special attention would be given to the management of natural openings within MAs with timber harvest.

Fish - Improvements would be made on 1,335 acres of reservoirs for resident trout.

Water - Riparian areas would be managed at minimum levels for water quality protection. Water quality would reflect watershed conditions created by managment practices, particularly the cumulative conditions created by high levels of timber harvest and road construction.

Research Natural Areas - This alternative would provide for research needs and opportunities through six Research Natural Areas (RNAs). Of the six RNAs included in this alternative, four are established areas, and two are proposed new areas to meet research needs of the Pacific Northwest Research Natural Area Committee.

ALTERNATIVE K

Goal Statement - Alternative K represents a low emphasis on nonmarket values and a high emphasis on commodity production. The management philosophy of this alternative is one which emphasizes a public understanding of the practices which are undertaken to maximize production of market goods from the forest, under multiple-use principles. The focus is to maintain high levels of timber harvest by making most of the Forest's tentatively suited land available for timber production. The objective is to maintain a timber supply level equal to the historical levels. This Alternative was formulated with input from the Willamette Forestry Council (WFC).

Roadless areas not designated as Wilderness in the 1984 Oregon Wilderness Act would be managed for a variety of multiple use values including timber, except for Bull of the Woods Roadless Area. The visual quality objective would be to allow all types of management activities to be seen in all areas, but the activities would not dominate the views.

Developed recreation would be emphasized, with all existing and inventoried potential developed recreation sites being managed and protected. The Forest transportation system would increase, making larger areas accessible for motorized recreation.

An objective would be to maintain water quality by insuring strict adherence to operational Best Management Practices.

Recreation - Privately managed sites and all publicly managed sites would be maintained and enhanced to meet increased demand for developed site use. In addition, the conversion of old sites to their original form and use; the expansion of other existing sites to increase capacity and diversity of opportunities; and the development of new sites would be employed to meet anticipated increases in demand for developed site use. This alternative also proposes the development of interpretive centers along major travel corridors such as the I-5 route to promote and facilitate use of the Forest. A 108-day managed season for developed facilities would be in effect.

Semiprimitive dispersed recreation opportunities are provided in areas that are unsuitable for timber production. Semiprimitive motorized use opportunities are provided from seven seperate areas in the Forest. Semiprimitive nonmotorized recreation opportunities are provided from three areas. The Oregon Cascades Recreation Area (OCRA) would be managed to provide only nonmotorized use in this alternative except for over the snow use.

Sixty-three percent of the Forest would be open to off-road vehicles (ORVs), 7% restricted to a specific season of use and/or type of vehicle, and 30% closed to ORVs.

Existing nonwilderness trails, totaling 714 miles, would be retained in this alternative. Additional trails would be developed as needed to accomodate increased trail related use. Periodic trail reconstruction and regular maintenance would be done to keep the entire trail system to standard.

Management of Wilderness would be accomplished with current budget levels. Increases in future use would be limited to user capacity of each WRS class MA. Trail maintenance, and resource protection and rehabilitation measures would be employed. No additional trails would be constructed.

Nomination of sites to the National Register of Historic Places would be performed as necessary.

Nine areas (2,715) having significant characteristics as either scenic, geologic, botanic, historic, or archeologic Special Interest Areas are included in this alternative. A portion of the historic Central Oregon Military Wagon Road is also included. Also in this alternative, seven specimen old-growth timber groves, totaling 853 acres, are allocated to provide for recreational use, educational study, and aesthetic appreciation.

Roadless Lands - This alternative would maintain significant portions of two inventoried roadless areas in an undeveloped condition. The Mt. Hagan roadless area would be allocated to multiple-use management, including timber harvests in this alternative.

Visual Resources - The central theme of scenic resource management in this alternative is to facilitate visual awareness and understanding by the forest users of all components of Forest management through demonstration of forest management activities. The overall scenic quality of Forest viewshed corridors however have a low to moderate emphasis.

The foreground areas of all State and Federal highways would be managed to ensure that alterations, while noticeable from within, remain subordinate to the character of the surrounding landscape. In addition, the foreground areas of several Forest roads are managed to ensure that alterations, while dominate, possess characteristics of form, line, color, and texture that occur in the surrounding landscape. Management activities within middleground viewing areas of State and Federal highways would also appear dominate but possess attributes of the surrounding landscape.

Old Growth - A minimum of approximately 305,000 acres of old growth (R-6 definition) would be maintained after fifty years in this alternative. These acres are in areas administratively and legislatively removed from development, lands unsuited for timber production, and areas set aside for riparian and wildlife Management Requirements. Old growth would also be present in timber production areas to some extent for several decades.

Timber - Timber harvest would be scheduled on a suited landbase of 932,813 acres. Approximately 797,000 acres would be managed on rotations of less than 100 years, and 136,000 acres on rotation ages of 100 to 200 years. The alternative would achieve about 97% of the "Forestry Program for Oregon" target without departing from non-declining flow. The Allowable Sale Quantity (ASQ) of 650 MMBF for the 1st decade would be about 4% higher than the average amount sold annually between 1977 and 1989.

Wildlife - Bald eagle protection would be provided in 21 areas including five active nest sites. Active nest sites would have site specific management plans prepared, and 30 acres of old growth habitat would be allocated for each potential nest site. All area within 1.1 miles of eleven major water bodies would be considered potential locations for roost, forage, or nest sites.

Management Requirements for peregrine falcon would be met by protecting two potential nest sites.

Suitable habitat would be provided to meet Management Requirements for the northern spotted owl, pileated woodpecker, and marten. Forest-wide habitat networks would be established for each species. This includes 59 spotted owl habitat areas occupied by 60 verified pairs of spotted owls. Approximately

82,782 acres would be specifically dedicated to spotted owl habitat. The remaining spotted owl habitat consists of lands unsuited for timber production. Habitat capability for 35 pairs of spotted owls would be provided in wilderness areas, occupied by 15 verified pairs. Habitat areas managed on 150 year harvest rotations would provide additional suitable habitat for pileated woodpeckers and marten. These extended rotation areas would be distributed and maintained in a pattern meeting Management Requirements for these species.

Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphais Areas. Winter range would be 11% high emphasis, 34% moderate emphasis, and 55% low emphasis. Forest-wide, optimal thermal cover would be provided wherever old growth habitat and no harvest allocations overlap. Habitat capability would be provided for a potential population 3720 elk and 17,762 deer, through the first decade.

Created openings contiguous to meadows, talus, cliffs, and caves would not exceed one-third the size of the natural opening perimeter.

Dead and defective tree habitat needed to meet the Management Requirements for primary cavity excavating birds would be provided. Habitat would be distributed to provide for 40% of the potential population forest-wide. Individual harvest units would be managed for 20% potential populations. A minimum of two logs per acre of would be left as large down woody material on at least 10 % of the harvested acres.

Habitat improvement projects would be planned in conjunction with timber sales. Projects would emphasize snag creation, access management, and forage enhancement.

Fish - Improvements would be made on 1,335 acres of reservoirs for resident trout.

Water - Riparian areas would be managed at minimum levels for water quality protection. Water quality would reflect watershed conditions created by management practices, particularly by the cumulative conditions created by high levels of timber harvest and road building.

Research Natural Areas - This alternative would provide for research needs and opportunities through five Research Natural Areas (RNAs). Of the five RNAs included in this alternative, four are established areas and one is a proposed new area to meet requirements of the Pacific Northwest Research Natural Area Committee.

ALTERNATIVE A (No Action)

Goal Statement - Alternative A represents implementation of the Forest's existing Land Allocations with the addition of Management Requirements for wildlife habitat and riparian areas, and updates on inventories of land suitability and timber yield tables. This alternative emphasizes a high level of timber production, with a low emphasis on roadless recreation, and other non-commodity forest uses.

Recreation - The current mix of public and private sector management of developed sites would remain unchanged. A 108-day managed season for developed facilities would be in effect.

Semiprimitive motorized and nonmotorized dispersed recreation opportunities would be provided from several land allocations including the Waldo Lake Recreation Area and the Oregon Cascades Recreation Area (OCRA). The OCRA is managed to provide motorized use throughout the year.

Sixty-one percent of the Forest would be open to off-road vehicles (ORVs); 39% would be either closed or restricted to a specified season of use and/or type of vehicle.

Existing nonwilderness trails, totaling 714 miles, are retained in this alternative; periodic trail reconstruction and regular maintenance would be done to keep the entire trail system to standard.

Management of Wilderness would be accomplished with current budget levels. Increases in future use would be limited to user capacity of each WRS class MA. Trail maintenance, and resource protection and rehabilitation measures would be employed routinely. No additional trails would be constructed.

Nomination of sites to the National Register of Historic Places would be performed as necessary.

The characteristics of four areas (1,109) in the Forest would be preserved as Special Interest Areas (SIAs) in this alternative. These are Monument Peak Botanical Area, Wolf Rock Geological Area, Lamb Butte Scenic Area, and Tumblebug Gorge Geological Area. Also in this alternative, 22 specimen old-growth timber groves, totaling 2,730 acres, are allocated to provide for recreational use, educational study, and aesthetic appreciation.

Roadless Lands - This alternative would maintain significant portions of eight inventoried roadless areas and lesser amounts of other inventoried roadless areas in an undeveloped condition. The majority of the Mt. Hagan roadless area would be allocated to multiple-use management, including a Research Natural Area and timber harvest.

Visual Resources - This alternative emphasizes a high to moderate level of scenic quality within foreground zones of all State and Federal highways. The overall scenic quality of Forest viewshed corridors, however, have a low to moderate emphasis.

The foreground areas of all State and Federal highways, selected major Forest roads, and selected trails would be managed to ensure that landscape alterations are not evident from within the area (Visual Quality Objective (VQO) of Retention). In addition, the foreground areas of selected Forest roads, and trails are managed to ensure that changes, while noticeable, remain subordinate to the character of the surrounding landscape (VQO of Partial Retention).

Portions of middleground view areas from State Highway 22 and State Highway 126 and from selected Forest roads, are managed to provide a landscape scene where alterations are subordinate to the character of the surrounding area (VQO of Partial Retention).

Old Growth - A minimum of approximately 337,000 acres of old growth (R-6 definition) are maintained after fifty years in this alternative. These acres are in areas administratively and legislatively removed from development, lands unsuited for timber production, and areas set aside for riparian and wildlife Management Requirements, and as specimen old-growth groves. Old growth would also be present in areas of timber production for several decades.

Timber - Timber harvest would be scheduled on a suited landbase of 874,291 acres. Approximately 743,400 acres would be managed on rotations of less than 100 years, and 131,000 acres on rotation ages of 100 to 200 years. The Allowable Sale Quantity (ASQ) of 608 MMBF for the 1st decade would be about 98% of the the average amount sold annually between 1977 and 1989.

Wildlife - Bald eagle protection would be provided in 21 areas including five active nest sites. Active nest sites would have site specific management plans prepared, and 30 acres of old growth habitat

would be allocated for each potential nest site. All area within 1.1 miles of eleven major water bodies would be considered potential locations for roost, forage, or nest sites.

Management Requirements for peregrine falcon would be met by protecting two potential nest sites.

Suitable habitat would be provided to meet Management Requirements for the northern spotted owl, pileated woodpecker, and marten. Forest-wide habitat networks would be established for each species. This includes 59 spotted owl habitat areas occupied by 60 verified pairs of spotted owls. Approximately 81,075 acres would be specifically dedicated to spotted owl habitat. The remaining spotted owl habitat consists of lands unsuited for timber production. Habitat capability for 35 pairs of spotted owls would be provided in wilderness areas, occupied by 15 verified pairs. Designating 100 marten habitat areas (160 acres each) and 38 pileated woodpecker habitat areas (300 acres each) would meet the Management Requirements for habitat distribution for these species. Additional marten and pileated woodpecker habitat would occur in spotted owl habitat areas, wilderness areas, and in other no harvest allocations.

Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphasis Areas. Winter range would be 18% high emphasis, 35% moderate emphasis, and 47% low emphasis. Forest-wide, optimal thermal cover would be provided wherever old growth habitat and no harvest allocations overlap. Habitat capability would be provided for a potential population 4285 elk and 21,425 deer through the fifth decade.

Created openings contiguous to meadows, talus, cliffs, and caves would not exceed one-third the size of the natural opening perimeter.

Dead and defective tree habitat needed to meet the Management Requirement for primary cavity excavating birds would be provided. Habitat would be distributed to provide for 40% of the potential population forest-wide. Individual harvest units would be managed for 20% potential populations. A minimum of two logs per acre of would be left as large down woody material on at least 10% of the harvested acres.

Habitat improvement projects would be planned in conjunction with timber sales. Projects would emphasize snag creation, access management, and forage enhancement.

Fish - Improvements would be made on 1,335 acres of reservoirs for resident trout.

Water - Riparian areas would be managed at minimum levels for water quality protection. Water quality would reflect watershed conditions created by management practices, particularly the cumulative changes in watershed condition resulting from timber harvest and road construction.

Research Natural Areas - This alternative would provide for research needs and opportunities through six Research Natural Areas (RNAs). Of the six RNAs included in this alternative, four are established areas, and two are proposed new areas to meet requirements of the Pacific Northwest Research Natural Area Committee.

ALTERNATIVE J

Goal Statement - Alternative J represents a moderate emphasis on nonmarket resources, and a moderate emphasis on commodity production. The focus is to balance the need for timber supply at levels near historical levels, while maintaining several important roadless areas, important old-growth

areas, and scenery issues in a way that provides some degree of issue resolution for each. This was the Preferred Alternative of the DEIS.

Recreation - All existing sites would remain open under the current mix of public and private management. Existing capacity of publicly managed sites would be expanded. A 108-day managed season for developed facilities would be in effect except where it is cost effective to extend the use season.

Emphasis is placed on maintaining significant portions of the Forest's semiprimitive dispersed recreation opportunities in an undeveloped condition. Areas available for semiprimitive nonmotorized recreation use total 89,458 acres, while motorized opportunities in a semiprimitive recreational setting are provided from 31,291 acres of Forest. The OCRA is managed to provide for motorized use over the entire area during winter, and on designated trails during snow free periods.

Fifty-nine percent of the Forest would be open to off-road vehicles (ORVs), 6% restricted to a specified season of use and/or type of vehicle, and 35% closed to ORVs.

All existing nonwilderness trails (714 miles) are retained in this alternative and 40 miles of new trails would be constructed, with priority given to those trails located in semiprimitive nonmotorized recreation areas. Periodic trail reconstruction and regular maintenance would be done to keep the entire trail system to standard.

Management of Wilderness would be accomplished with current budget levels. Increases in future use be limited to user capacity of each WRS class MA. Trail maintenance, and resource protection and rehabilitation measures would be employed routinely. No additional trails would be constructed.

Interpretation of cultural sites and public awareness efforts would be maintained at current levels. Nomination of all Forest historic sites to the National Register of Historic Places would be emphasized.

Twenty-seven areas (22,598) having significant characteristics as either scenic, geologic, botanic, historic, or archeologic Special Interest Areas are included in this alternative. The McKenzie River from Scott Creek to the Forest boundary, Fall Creek, and the South Fork of the McKenzie River would be designated as Special Interest Areas. Also included as Special Interest Areas would be the historic Santiam Wagon Road and portions of the historic Central Oregon Military Wagon Road. 18 specimen old-growth timber groves, totaling 4,096 acres, are allocated to provide for recreational use, educational study, and aesthetic appreciation.

Roadless Lands - This alternative would maintain significant portions of 13 inventoried roadless areas, and lesser amounts of other inventoried roadless areas, in an undeveloped condition. The majority of the Mt. Hagan roadless area would be allocated to multiple-use management, including a Research Natural Area and timber harvest.

Visual Resources - This alternative emphasizes a moderate level of scenic quality within major viewshed corridors.

The foreground areas of all State and Federal highways, major Forest roads, and selected trails would be managed to ensure that landscape alterations are not evident (VQO of Retention). In addition, the foreground areas of selected Forest roads and trails are managed to ensure that changes, while noticeable, remain subordinate to the character of the surrounding landscape (VQO of Partial Retention).

Portions of the middleground areas of State Highways 22, 126, and 58 and U.S. Highway 20 viewshed corridors, and the viewsheds of selected Forest roads, are managed to provide a landscape scene where alterations are subordinate to the character of the surrounding area (VQO of Partial Retention). In addition, the remaining middleground areas of viewshed corridors and the viewsheds of several Forest roads are managed to ensure that alterations, although visually dominant, possess characteristics of form, line, color, texture, and scale that occur in the surrounding landscape (VQO of Modification).

Old Growth - A minimum of approximately 341,400 acres of old growth (R-6 definition) are maintained after fifty years in this alternative. These acres are in MAs administratively and legislatively removed from development, lands unsuited for timber production, and areas set aside for riparian and wildlife Management Requirements. Old growth would also be present in areas in timber production areas for several decades.

Timber - Timber harvest would be scheduled on a suited landbase of 853,389 acres. Approximately 720,000 acres would be managed on rotations of less than 100 years, and 133,000 acres on rotation ages of 100 to 200 years. The Allowable Sale Quantity (ASQ) of 530 MMBF for the 1st decade would be about 85% of the average amount sold annually between 1977 and 1989.

Wildlife - Bald eagle protection would be provided in 24 areas including five active nest sites. Active nest sites would have site specific management plans prepared, and 30 acres of old growth habitat would be allocated for each potential nest site. All area within 1.1 miles of eleven major water bodies would be considered potential locations for roost, forage, or nest sites.

Management Requirements for peregrine falcon would be met by protecting 12 potential nest sites.

Suitable habitat would be provided to meet Management Requirements for the northern spotted owl, pileated woodpecker, and marten. Forest-wide networks would be established for each species. This includes 59 spotted owl habitat areas occupied by 60 verified pairs of spotted owls. Approximately 70,560 acres would be specifically dedicated to spotted owl habitat. The remaining spotted owl habitat consists of lands unsuited for timber production. Habitat capability for 35 pairs of spotted owls would be provided in wilderness areas, occupied by 15 spotted owl pairs. Designating 100 marten habitat areas (160 acres each) and 38 pileated woodpecker habitat areas (300 acres each) would meet the Management Requirements for habitat distribution for these species. Additional marten and pileated woodpecker habitat would occur in spotted owl habitat areas, wilderness areas, and in other no harvest allocations.

Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphasis Areas. Winter range would be 35% high emphasis, 26% moderate emphasis, and 39% low emphasis. Forest-wide, optimal thermal cover would be provided wherever old growth habitat and no harvest MAs overlap. An additional 4970 acres of optimal thermal cover would be allocated to site specific high emphasis winter ranges. Habitat capability would provide for a potential population 5709 elk and 28,545 deer through the first decade. The habitat capability would decline through the fifth decade resulting in habitat capable of providing potential populations of 4441 elk and 22,210 deer.

Created openings contiguous to meadows, talus, cliffs, and caves would not exceed one-third the size of the natural opening perimeter. Protection of these special and unique habitats would result in 11,348 acres removed from lands suited for timber production.

Dead and defective tree habitat needed to meet the Management Requirement for primary cavity excavating birds would be provided. Habitat would be distributed to provide for 40% of the potential population within each sub-watershed. Individual harvest units could be managed for 20% potential

populations provided the sub-watershed habitat objective is met. A minimum of two logs per acre of would be left as large down woody material on at least 10% of the harvested acres.

Habitat enhancement projects would be planned in conjunction with timber sales. Projects would emphasize snag creation, access management, and forage enhancement.

Fish - Improvements would be made on 1,335 acres of reservoirs for resident trout.

Water - Riparian areas would be managed at minimum levels for water quality protection. Water quality would reflect watershed conditions created by management practices, particularly the cumulative conditions resulting from the levels of roadbuilding and timber harvest emphasized in the alternative.

Research Natural Areas - This alternative provides for research needs and opportunities through nine Research Natural Areas (RNAs). Of the nine RNAs included in this alternative four are established areas and five are proposed new areas to meet requirements of the Pacific Northwest Research Natural Area Committee.

ALTERNATIVE W

Goal Statement - This alternative is designed to provide a healthy, diverse, and productive ecosystem that would ensure the capability of the Forest to produce a continuous flow of a variety of goods and services to the public over the long-term. Alternative W was formulated to respond to public comments to the Draft Land and Resource Management Plan.

The ability to provide a dependable supply of timber to the market would continue. This alternative recognizes the importance of maintaining old-growth characteristics in some managed stands. Where timber production is either reduced below biological potential or removed from scheduled timber production to provide other resource benefits, this alternative would emphasize the use of these areas to support other compatible goals such as wildlife, dispersed recreation, watershed protection, biological diversity and ecological studies.

Additional recreation opportunities would include expanding activities compatible with areas withdrawn from timber harvesting as well as providing opportunities such as low elevation hiking trails within areas intensively managed for timber production.

A special emphasis of this alternative would be to recognize the role of river corridors and streamside zones on the Forest as critical components in the overall ecosystem. Management activities in these areas would focus on maintaining and enhancing the long term productivity, first, for those uses dependent on rivers and streams and secondly, for other resources. Timber scheduling would be responsive to the cumulative effects of watershed conditions. Very effective Best Management Practices would be used in the area of potentially unstable lands and Class IV streams.

Recreation - All existing sites would remain open under the current mix of public and private management. Existing capacity of publicly managed sites would be expanded. In addition new sites would be identified for development to meet expected demand for developed site use. A 108-day managed season for standard service facilities would be in effect except where it is cost effective to extend the season.

Emphasis is placed on maintaining significant portions of the Forest's semiprimitive dispersed recreation opportunities in an undeveloped condition. Areas available for semiprimitive nonmotorized recreation use total 85,768 acres, while motorized opportunities in a semiprimitive recreational setting are provided

from 36,048 acres of Forest. The OCRA is managed to provide for motorized use over the entire area during winter, and on designated trails during snow free periods.

57% of the Forest is open to off-road vehicles (ORVs), 6% is restricted to a specified season of use and/or type of vehicle, and 37% is closed to ORVs.

All existing non-Wilderness trails (714 miles) are retained in this alternative and 60 miles of new trails would be constructed. In addition all existing and proposed non-Wilderness trails (1,266 miles) are assigned to one of four trail management classes. Each Trail Management Class provides protection to individual trails and trail segments in relation to the amount and type of use, user experiences, public interest, and adjacent management influences associated with each trail segment. Periodic trail reconstruction and regular maintenance would be done to keep the entire trail system to standard.

Management of Wilderness would be accomplished with increased budget levels. Increases in future use would be limited to user capacity of each WRS class MA. Trail maintenance, and resource protection and rehabilitation measures would be employed routinely. No additional trails would be constructed.

Interpretation of cultural sites and public awareness efforts would be maintained at current levels. Nomination of all Forest historic sites to the National Register of Historic Places would be emphasized.

Forty-seven areas (31,120) having significant characteristics as either scenic, geologic, botanic, historic, or archeologic Special Interest Areas are included in this alternative. The McKenzie River from Scott Creek to the Forest boundary, Fall Creek, and the South Fork of the McKenzie River are designated as Special Interest Areas. Also included as Special Interest Areas are the historic Santiam Wagon Road and portions of the historic Central Oregon Military Wagon Road. In addition this alternative includes 32 specimen old-growth timber groves, totaling 6,655 acres, to provide for recreational use, educational study, and aesthetic appreciation.

Roadless Lands - This alternative maintains significant portions of 13? inventoried roadless areas, and lesser amounts of other inventoried roadless areas, in an undeveloped condition. The majority of the Mt. Hagan roadless area would be allocated to multiple-use management, including a Research Natural Area and timber harvest.

Visual Resources - This alternative emphasizes a moderate level of scenic quality within major viewshed corridors.

The foreground areas of all State and Federal highways, major Forest roads, and selected trails are managed to ensure that landscape alterations are not evident (VQO of Retention). In addition, the foreground areas of selected Forest roads and trails are managed to ensure that changes, while noticeable, remain, at least, subordinate to the character of the surrounding landscape (VQO of Partial Retention).

Portions of the middleground areas of State Highways 22, 126, and 58 and U.S. Highway 20 viewshed corridors, and the viewsheds of selected Forest roads, are managed to provide a landscape scene where alterations are subordinate to the character of the surrounding area (VQO of Partial Retention). In addition, the remaining middleground areas of viewshed corridors and the viewsheds of several Forest roads are managed to ensure that alterations, although visually dominant, possess characteristics of form, line, color, texture, and scale that occur in the surrounding landscape (VQO of Modification).

Old Growth - Critical components of old growth, such as down woody debris and scattered residual trees are maintained in intensively managed stands.

Approximately 365,200 acres of old growth (R-6 definition) are maintained after fifty years in this alternative. These acres are in areas administratively and legislatively removed from development, lands unsuited for timber production, areas set aside for riparian, special wildlife habitats, management indicator species, and as specimen Old-Growth groves. Old growth would also be present in areas of timber production for several decades.

Timber - Timber harvest would be scheduled on a suited landbase of 774,608 acres. Approximately 689,000 acres would be managed on rotations of less than 100 years, and 85,000 acres on rotation ages of 100 to 200 years. The Allowable Sale Quantity (ASQ) of 491 MMBF for the 1st decade would be about 79% of the average amount sold annually between 1977 and 1989.

Timber harvest design would include:

Maintaining critical components of old growth, such as down woody debris and scattered residual trees, in intensively managed stands;

Minimizing the fragmentation of forest stands, particularly mature and older stands, by utilizing management options of scheduling the location and timing of harvest.

Wildlife - Bald eagle protection would be provided in 24 areas including five active nest sites. Active nest sites would have site specific management plans prepared, and at least 125 acres of old growth habitat would be allocated for each potential nest site. All area within 1.1 miles of eleven major water bodies would be considered potential locations for roost, forage, or nest sites.

Management Requirements for peregrine falcon would be met by protecting 12 potential nest sites.

Suitable habitat would be provided to meet Management Requirements for the northern spotted owl, pileated woodpecker, and marten. Forest-wide networks would be established for each species. This includes 59 spotted owl habitat areas occupied by 60 verified pairs of spotted owls. Approximately 69,045 acres would be specifically dedicated to spotted owl habitat. The remaining spotted owl habitat consists of lands unsuited for timber production. Habitat capability for 35 pairs of spotted owls would be provided in wilderness areas, occupied by 15 verified pairs. Designating 100 marten habitat areas (160 acres each) and 38 pileated woodpecker habitat areas (300 acres each) would meet the Management Requirements for habitat distribution for these species. Some marten and pileated woodpecker habitat areas overlap with visual corridors managed on rotations of 150 to 200 years. Where this occurs, these habitat areas would be managed to meet habitat requirements. Managed marten areas would be 500 acres, and managed pileated woodpecker areas would be 1000 acres. Additional marten and pileated woodpecker habitat would occur in spotted owl habitat areas, wilderness areas, and in other no harvest allocations.

Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphasis Areas. Winter range would be 31% high emphasis, 46% moderate emphasis, and 23% low emphasis. Forest-wide, optimal thermal cover would be provided wherever old growth habitat is protected in no harvest MAs, or where MAs have rotations longer than 170 years. Site specific allocation of 4100 acres of optimal thermal cover would be made for high emphasis winter ranges. Habitat capability would be provided for a potential population of 6089 elk and 30,628 deer through the first decade. An additional allocation of approximately 1200 acres of optimal thermal cover would be required to maintain habitat capability through the fifth decade.

Buffers would be provided around natural meadows, marshes, bogs, cliffs, talus, and caves to protect microclimate conditions and overall habitat values of these areas. Protection of microclimate and unique habitats would result in 31,334 acres removed from lands suited for timber production.

Dead and defective tree habitat needed to meet the Management Requirement for primary cavity excavating birds would be provided. Habitat would be distributed to provide for 40% of the potential population within each sub-watershed. Individual harvest units could be managed for 20% potential populations provided the subwatershed habitat objective is met. An average of 8-15 logs per acre would be left as large down woody material on all harvested acres.

Habitat improvement projects would be planned in conjunction with timber sales and through the development of an active habitat enhancement program throughout the Forest. Projects would emphasize a broad spectrum of wildlife habitat projects including waterfowl habitat, osprey platforms, sensitive plant habitat, snag creation, access management, elk forage enhancement, wetland development and enhancement, bald eagle nest, roost,and forage area enhancement, and establishment of peregrine falcon nest sites.

Fish - Improvements would be made on 1,450 acres of reservoirs for resident trout. Riparian areas would be managed to increase levels of Large Woody Material recruited to the stream above current levels.

Water - Management practices would maintain or improve water quality to levels which meet or exceed the needs of the beneficial uses of the water. Riparian areas would be managed above minimum levels for water quality in order to aid in the recovery of current stream conditions, and to meet objectives for dispersion of wildlife between habitat areas, and recreation opportunities. No harvest would be programmed adjacent to Class I, II and III streams. Timber harvest would be designed to minimize risk of debris torrents by retaining trees as needed to provide stability in areas of moderately stable and potentially highly unstable landtypes on slopes adjacent to Class IV streams. Timber harvest would be scheduled at rates which would consider the cumulative effects on peak flows in subdrainages. Because of the importance and uniqueness of the streams and riparian areas, this alternative would stress the need to complete an inventory of these areas and prescribe treatments based on site-specific conditions.

Research Natural Areas - This alternative provides for research needs and opportunities through nine Research Natural Areas (RNAs). Of the nine RNAs included in this alternative four are established areas and five are proposed new areas to meet requirements of the Pacific Northwest Research Natural Area Committee.

ALTERNATIVE D

Goal Statement - Alternative D represents a high emphasis on non-market resources with a moderate emphasis on commodity production.

Habitat for Pileated Woodpecker, Martens, and Spotted Owls would exceed levels required for Management Levels. Many areas would be managed for high quality big game habitat, and many unique special wildlife habitat areas would be recognized.

Dispersed Recreation would be emphasized by maintaining several Roadless areas in their current condition. The scenic quality from many major highways would remain natural.

Riparian areas would be managed to provide input of near-natural levels of large woody material for fish habitat maintenance and improvement.

Recreation - All existing developed recreation sites would remain open. To meet future demand, the existing capacity of publicly managed sites would be expanded through development of new sites. A 120-day managed season for developed facilities would be in effect.

Emphasis would be placed on maintaining the Forest's semiprimitive dispersed recreation opportunities in an undeveloped condition. Areas available for semiprimitive nonmotorized recreation use total 176,484 acres, while motorized opportunities in a semiprimitive recreational setting are provided from 38,245 acres.

In this alternative 54% of the Forest is open to off-road vehicles (ORVs), 5% is restricted to a specified season of use and/or type of vehicle, and 41% is closed to ORVs. The OCRA is managed to provide motorized use over the entire area in winter, and on designated trails during snow free periods.

All existing nonwilderness trails (714 miles) are retained in this alternative, and 68 miles of new trail would be constructed with priority given to those trails located in semiprimitive nonmotorized recreation areas. Periodic trail reconstruction and regular maintenance would be done to keep the entire trail system to standard.

Wilderness would be managed for primitive and semiprimitive WRS class opportunities. Areas that currently exceed capacity for these opportunities would be regulated to reduce social and physical resource impacts and enhance user experiences. Future use would be limited to user capacity levels of each WRS class MA. Trail maintenance, and resource protection and rehabilitation measures would be employed routinely. No new trails would be constructed.

On-site interpretation of specific aspects of cultural resource management is featured. Nomination of sites to the National Register of Historic Places would be performed as necessary.

The McKenzie River from Scott Creek to the Forest boundary is allocated as a Special Interest Area in this alternative. The characteristics of 28 of 49 potential Special Interest Areas are preserved by their allocation to a Special Interest Area MA. In this alternative the historic Santiam Wagon Road and the Oregon Military Wagon Road are included as Special Interest Areas. Also 18 groves of specimen old-growth timber, totaling 3,029 acres, would be maintained to provide for such uses as recreation, aesthetic appreciation, and educational purposes.

Roadless Lands - This alternative maintains significant portions of most inventoried roadless areas, and lesser amounts of other inventoried roadless areas in an undeveloped condition. The Mt. Hagan roadless area would be allocated to dispersed recreation, semi-primitive nonmotorized and Research Natural Area prescriptions.

Visual Resources - This alternative emphasizes a high level of scenic quality throughout the Forest.

The foreground areas of all State and Federal highways, major Forest roads, and selected trails are managed to ensure that landscape alterations are not evident (VQO of Retention). In addition, the foreground areas of selected Forest roads, and trails are managed to ensure that changes, while noticeable, remain subordinate to the character of the surrounding landscape (VQO of Partial Retention).

Also, portions of the middleground areas of all State and Federal highways and major Forest road viewshed corridors are managed to ensure that changes remain subordinate to the character of the

surrounding area (VQO of Partial Retention). In addition, the middleground areas of several Forest viewshed corridors are managed to provide landscapes in which physical alterations vary from being noticeable but subordinate, to visually dominant (VQO of Partial Retention to Modification).

Old Growth - A minimum of approximately 368,000 acres of old growth (R-6 definition) are maintained after fifty years in this alternative. These acres are in areas administratively and legislatively removed from development, lands unsuited for timber production, areas set aside for riparian and wildlife Management Requirements, and as specimen Old-Growth groves. Old growth would remain in some portions of areas managed for intensive timber harvest through the planning period.

Timber - Timber harvest would be scheduled on a suited landbase of 719,439 acres. Approximately 639,000 acres would be managed on rotations of less than 100 years, and 80,000 acres on rotation ages of 100 to 200 years. The Allowable Sale Quantity (ASQ) of 476 MMBF for the 1st decade would be about 77% of the average amount sold annually between 1977 and 1989.

Wildlife - Bald eagle protection would be provided in 27 areas including five active nest sites. Active nest sites would have site specific management plans prepared, and at least 125 acres of old growth habitat would be allocated for each potential nest site. All area within 1.1 miles of eleven major water bodies would be considered potential locations for roost, forage, or nest sites.

Management Requirements for peregrine falcon would be met by protecting 12 potential nest sites.

Suitable habitat would be provided to exceed Management Requirements for the northern spotted owl, pileated woodpecker, and marten. Forest-wide networks would be established for each species. This includes 98 spotted owl habitat areas occupied by verified pairs of spotted owls. Approximately 121,248 acres would be specifically dedicated to spotted owl habitat. The remaining spotted owl habitat consists of lands unsuited for timber production. Habitat capability for 40 pairs of spotted owls would be provided in wilderness and roadless areas, occupied by 20 verified pairs. Designating 100 marten habitat areas (160 acres each) and 38 pileated woodpecker habitat areas (300 acres each) would ensure Management Requirements for habitat distribution are met these species. Additional marten and pileated woodpecker habitat would occur in spotted owl habitat areas, wilderness areas, and in other no harvest allocations.

Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphasis Areas. Winter range would be 66% high emphasis, 21% moderate emphasis, and 14% low emphasis. Forest-wide, optimal thermal cover would be provided wherever old growth habitat is protected in no harvest MAs, or where MAs have rotations longer than 170 years. A site specific allocation of 7600 acres of optimal thermal cover would be made for high emphasis winter ranges. Habitat capability would be provided for a potential population of 9019 elk and 45,325 deer through the fifth decade.

Buffers approximately 400 feet wide would be provided around natural meadows, marshes, bogs, cliffs, talus, and caves to protect microclimate conditions and overall habitat values of these areas. Protection of these special and unique habitats would result in an estimated 20,000 acres removed from lands suited for timber production.

Dead and defective tree habitat needed to exceed Management Requirements for primary cavity excavating birds would be provided. Habitat would be distributed to provide for 60% potential populations within each sub-watershed. Individual harvest units would also be managed for 60% potential populations. An average of 8-15 logs per acre would be left as large down woody material on all harvested acres.

Habitat improvement projects would be planned in conjunction with timber sales and through the development of an active habitat enhancement program throughout the Forest. Projects would emphasize

sensitive species inventories as well as wildlife habitat projects including waterfowl nesting habitat, osprey platforms, sensitive plant habitat restoration, snag creation, access management, elk forage enhancement, wetland development and enhancement, bald eagle nest, roost and forage area enhancement, and establishment of peregrine falcon nest sites.

Fish - Improvements would be made on 1,450 acres of reservoirs and streams. Riparian areas along Class I and II streams would be managed to provide near or above natural levels of input of large woody material for fish habitat.

Water - Riparian areas along streams, lakes would be managed above minimum levels for water quality. No timber harvest would be scheduled along Class I and II streams, and timber harvest along Class III riparian areas would be based on 200 year rotations. Timber harvest would be designed to protect areas of potentially unstable landtypes upslope and adjacent to Class IV streams. Water quality would reflect watershed conditions created by management practices.

Research Natural Areas - This alternative provides for research needs and opportunities through eight Research Natural Areas (RNAs). Of the eight RNAs included in this alternative, four are established areas and four are proposednew areas to meet requirements of the Pacific Northwest Research Natural Area Committee.

ALTERNATIVE L

Goal Statement - Alternative L places a high emphasis on nonmarket values, and low emhasis on timber commodity values by preserving areas currently not highly impacted by past management activities in their natural condition and by proposing other areas for natural recovery from the effects of past management. This alternative was formulated with input from the Oregon Natural Resources Council (ONRC).

High levels and quality of recreation opportunities and experiences would be provided. Scenery would be enhanced by managing all areas according to Visual Quality Objectives, and by rehabilitating unacceptable modifications.

The full inventory of roadless areas would be maintained in an undeveloped condition with an emphasis on semi-primitive nonmotorized activities. Opportunities for high quality Wilderness experiences would be increased by proposing additional areas for Wilderness study and for Wilderness designation.

The quantity, quality and diversity of plant and animal communities would be maintained at high levels. All management requirements for Pileated Woodpeckers, Martens and Spotted Owl would be exceeded, and habitat would be provided for the full inventory of verified Spotted Owl pairs. All areas of diverse habitats, geological significant areas, and millenium old-growth groves would be managed to protect and enhance desirable attributes. Old-growth characteristics would be retained in all managed stands.

Riparian areas would be managed to maintain and enhance riparian dependent species and connective corridors across the landscape.

Recreation - All existing developed recreation sites would remain open. To meet future demand, the existing capacity would be expanded. High levels of recreation opportunities and high quality experiences would be provided. A 120-day managed season for developed facilities would be in effect.

This alternative provides the maximum amount of motorized and nonmotorized areas for semiprimitive recreation opportunities. Emphasis is placed on maintaining opportunity settings in their undeveloped condition. In this alternative, the Oregon Cascades Recreation Area is managed for nonmotorized use year-round.

Thirty-eight percent of the Forest is open to off-road vehicles (ORVs), 3% is restricted to a specified season of use and/or type of vehicle, and 59% is closed to ORVs.

All existing nonwilderness trails (714 miles) are retained in this alternative, and 40 miles of new trail would be constructed with priority given to those trails located in semiprimitive nonmotorized recreation areas. Periodic trail reconstruction and regular maintenance would be done to keep the entire trail system to standard.

All Wilderness would be managed for primitive and semiprimitive use opportunities. High quality Wilderness experiences would be provided by proposed additional Wilderness. Areas that currently exceed capacity for these opportunities would be regulated to reduce social and physical resource impacts and enhance user experiences. Future use would be limited to user capacity of each WRS class MA. Trail maintenance and resource protection and rehabilitation measures would be employed routinely. No new trails would be constructed.

On-site interpretation of specific aspects of the cultural resource, as well as off-site public awareness of management programs is featured. All eligible cultural resource sites would be nominated to the National Register of Historic Places.

The characteristics of all potential Special Interest Areas are preserved in this alternative. However, only 7 areas are allocated to a Special Interest MA prescription. The remaining areas are included in other nondevelopment MAs. Also 24 groves of specimen old-growth timber, totaling 3,056 acres, would be maintained to provide for such uses as recreation, aesthetic appreciation, and educational purposes in this alternative.

Visual Resources - This alternative emphasizes a high level of scenic quality throughout the Forest.

The foreground areas of State and Federal highways, major Forest roads, and selected trails are managed to ensure that landscape alterations are not evident (VQO of Retention). Although these areas are not in each case allocated to Scenic Resource MAs they, however, provide comparable scenic quality levels. In addition, the foreground areas of selected Forest roads and trails are managed to ensure that changes, while noticeable, remain subordinate to the character of the surrounding landscape (VQO of Partial Retention).

Also, portions of the middleground areas of all State and Federal highways and major Forest road viewshed corridors are managed to provide a landscape where physical alterations, while noticeable, are subordinate to the surrounding area (VQO of Partial Retention). In addition, the middleground areas of several Forest viewshed corridors are managed to provide landscapes in which physical alterations vary from subordinate to not evident (VQO of Retention to Partial Retention).

Roadless Lands - This alternative recommends designation of several roadless areas to Wilderness status, and maintains nearly all inventoried roadless areas in an undeveloped condition. About 85% of current roadless lands would be maintained in a roadless condition, with an emphasis on preserving wilderness values and maintaining semiprimitive non motorized opportunities.

Old Growth - This alternative emphasizes the continuation of old-growth characteristics throughout the Forest. Lands of 300 acres and more, where 70% of the trees are mature, would be managed as old-growth reserves, with no-harvest. Areas of at least 300 acres which have not previously been managed for timber production, and where at least 70% of the forest is young, natural stands, would be managed on rotations of up to 240 years, with harvest activity permitted only from the existing road system. Areas on smaller blocks of old growth would be managed with rotations lengths of between 80 and 160 years. In these and other areas 8 to 10 mature trees per acre would be maintained to provide future old-growth characteristics.

Approximately 523,000 acres of old growth (R-6 definition) are maintained after fifty years in this alternative. These acres are in areas administratively and legislatively removed from development, lands unsuited for timber production, and areas set aside for a variety of uses.

Timber - Timber would be managed for commercial use on 553,090 acres of the Forest, with approximately 314,000 acres in rotation ages of less that 100 years, and 239,000 acres in rotation ages of 100 to 200 years. The Allowable Sale Quantity (ASQ) of 150 MMBF for the 1st decade would be 24% of the average amount sold annually between 1977 and 1989.

Wildlife - Bald eagle protection would be provided in 27 areas including five active nest sites. Active nest sites would have site specific management plans prepared, and at least 125 acres of old growth habitat would be allocated for each potential nest site. All area within 1.1 miles of eleven major water bodies would be considered potential locations for roost, forage, or nest sites.

Management Requirements for peregrine falcon would be met by protecting 12 potential nest sites.

Suitable habitat would be provided to exceed Management Requirements for the northern spotted owl, pileated woodpecker, and marten. Forest-wide networks would not be established for each species. The emphasis placed on protection and replacement of mature and old growth forests would maintain habitat capability for the full inventory of verified spotted owl pairs. The full inventory is 219 verified pairs of spotted owls. Habitat capabiltiy for pileated woodpeckers and marten would be above the Management Requirement. Distribution and quality of mature and old growth habitat would not be limited.

Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphasis Areas. Winter range would be 41% high emphasis, 42% moderate emphasis, and 17% low emphasis. Forest-wide, optimal thermal cover would not be limiting because of the amount of the Forest in no harvest and extended rotation MAs. Created opening would become limiting and would result in the need to intensively manage natural and created openings for deer and elk forage production. Habitat capability would be provided for a potential population of 7068 elk and 35,340 deer through the fifth decade.

Buffers would be provided around natural meadows, marshes, bogs, cliffs, talus, and caves to protect microclimate conditions and overall habitat values of these areas. Protection of these special and unique habitats would result without a specific allocation reducing lands suited for timber production.

Dead and defective tree habitat needed to exceed Management Requirements for primary cavity excavating birds would be provided. Habitat would be distributed to provide for 60% potential populations within each sub-watershed. Individual harvest units would also be managed for 60% potential populations. An average of 8-15 logs per acre would be left as large down woody material on all harvested acres.

Habitat improvement opportunities planned in conjunction with timber sales would be limited. Projects would emphasize forage enhancement using native plant species and snag creation. Wildlife habitat programs would be oriented more toward inventory and monitoring with reduced need for mitigation habitat loss.

Fish - Improvement projects, for resident fish, would be implemented on 1,450 acres of reservoirs and streams. Riparian management of Class I and II streams would continue near or above natural levels of input of woody material.

Water - Riparian areas would be managed above minimum levels for water quality in order to aid in the recovery of current stream conditions, and to meet objectives for other riparian resources. Full protection of riparian areas along Class III streams would minimize reduction in water quality. Timber harvest would be designed to protect areas of potentially unstable landtypes upslope and adjacent to Class IV streams.

Research Natural Areas - This alternative provides for research needs and opportunities through four established Research Natural Areas (RNAs).

COMPARISON OF ALTERNATIVES

Overview

This section presents the alternatives in a manner designed to facilitate comparison. The aspects of alternatives presented for comparison include:

- Allocations of land to specific management areas;
- Resource management programs;
- Activities, resource outputs, and environmental effects;
- Responsiveness to issues and concerns;
- Economic criteria including costs, benefits, present net value and cash flows.

These items are presented in map, tabular, and written form, with the intent of condensing a great deal of complex information into a format which allows efficient and effective comparison of Alternatives. This section concludes with a discussion of the principal tradeoffs associated with each alternative.

The purpose of forest planning is to identify and select for implementation the Alternative which most nearly maximizes net public benefits while responding effectively to the public issues. Net public benefits are defined as the "...overall long-term value to the nation of all outputs and positive effects (benefits), less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not...consistent with the principles of multiple use and sustained yield" (36 CFR 219.3).

The assessment of net public benefits must include both those outputs which have prices (such as timber and developed recreation) and those to which no price can be attached (such as scenic quality and the maintenance of viable wildlife populations). Thus, net public benefits cannot be expressed as a single, quantitative measure, but rather must be gauged using both quantitative and qualitative criteria. There is no precise formula for determining which Alternative maximizes net public benefits. Indeed, there are often differences of opinion as to whether particular outputs or effects are benefits or costs. Therefore, it is necessary to identify major effects of each alternative separately to serve as the basis for analysis, judgement, and selection of the preferred Alternative. The remainder of this section highlights these effects in a comparative manner to facilitate identification of net public benefits.

Management Areas

Management areas are portions of the National Forest to which a specific set of management practices are applied and for which standards and guidelines have been developed. All of the management areas considered in the alternatives, which provide for all multiple-uses and resources, are briefly described. Although a specific use or resource may be featured or emphasized in each management area, all other uses and resources are provided for in the standards and guidelines established for each management area.

Forest land is managed in accord with the standards and guidelines of the management area to which it is allocated. This assures that potentially adverse environmental effects are avoided, minimized, rectified, reduced, or otherwise mitigated while achieving basic management area objectives. Standards and guidelines were developed by an interdisciplinary team to ensure integration and coordination of the various multiple uses and resource values, and to respond to the specific environmental conditions of the Forest. Standards and guidelines that apply to the entire Forest were also developed, and are displayed in Chapter IV of the Proposed Forest Plan.

The land area of the Forest is allocated to management areas differently in each alternative. Table II-3 illustrates how the allocation of Forest land to management areas differs among the Alternatives. Alternatives are arrayed in this table in order of decreasing vegetation management using suitable acres as an indicator. A detailed prescription for each management area can be found in Chapter IV of the proposed Forest Plan. Following is a brief summary of each management area.

Table II-3. Management Area Acreage of Alternatives

	Alternatives						
Management Areas	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
1 Wilderness	380,805 [1]						
Management Area 1a	NA	14,482	14,482	3,305	2,111	--	2,316
Management Area 1b	NA	25,958	25,958	36,730	34,958	14,482	81,770
Management Area 1c	NA	41,018	41,018	41,423	43,963	66,976	54,845
Management Area 1d	NA	299,347	299,347	299,347	299,773	299,347	411,234[6]
2 Oregon Cascades Recreation Area							
Management Area 2a	6,058	--	6,058	1,152	1,152	1,152	--
Management Area 2b	--	6,058	--	4,906	4,906	4,906	6,058
3 Experimental Forest							
Management Area 3	15,379	15,379	15,379	15,379	15,379	15,379	15,379
4 Research Natural Area							
Management Area 4	4,245	3,434	4,245	6,655	7,124	6,015	2,197
5 Special Interest Area							
Management Area 5a	1,109	2,751	1,109	19,410	27,942	15,230	3,391
Management Area 5b	--	--	--	3,178	3,178	--	--
6 Wild and Scenic River							
Management Area 6a [2]	--	--	--	--	--	--	--
Management Area 6b	1,237	1,237	1,237	1,237	1,237	1,237	1,237
Management Area 6c	13,225	13,225	13,225	13,225	13,225	13,225	25,788
7 Old-Growth Grove							
Management Area 7	2,730	853	2,730	4,906	6,655	3,029	199,883
8 T & E Species [3]							
Management Area 8	1,472	1,472	1,472	1,472	1,472	1,472	1,472
9 Special Habitat [4]							
Management Area 9a	--	82,782	81,075	70,560	69,045	121,248	37,541
Management Area 9b	--	10,857	11,262	10,025	9,513	8,788	7,146
Management Area 9c	--	15,870	15,742	14,867	14,568	13,182	10,601
Management Area 9d	--	9,364	--	14,888	31,355	17,555	35,386

Table II-3 Cont. Management Area Acreage of Alternatives

	Alternatives						
Management Areas	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
10 Dispersed Recreation							
Management Area **10a**	--	--	--	2,090	299	2,794	--
Management Area **10b**	17,747	41,849	17,213	15,699	19,645	3,455	28,049
Management Area **10c**	--	--	--	7,977	8,873	29,947	38,245
Management Area **10d**	15,956	--	12,883	2,112	960	6,911	--
Management Area **10e**	55,181	4,949	55,181	72,672	69,898	163,655	93,746
Management Area **10f**	--	2,773	--	3,008	3,605	2,901	341
11 Scenic							
Management Area **11a**	--	96,369	--	201,227	138,176	86,080	--
Management Area **11b**	--	19,218	--	363	256	1,386	--
Management Area **11c**	23,529	26,748	19,133	52,322	70,090	114,239	184,057
Management Area **11d**	49,294	3,925	41,999	39,844	24,316	41,188	--
Management Area **11e**	12,883	7,892	11,134	5,972	8,212	4,074	51,021
Management Area **11f**	52,259	41,892	46,457	43,599	36,347	66,998	122,968
12 Developed Recreation							
Management Area **12a**	2,218	2,517	2,218	2,304	2,709	2,581	4,266
Management Area **12b**	2,112	2,112	2,112	2,368	2,389	2,133	--
13 Special and Administrative Use							
Management Area **13a**	3,839	3,839	3,839	3,839	3,839	3,839	4,543
Management Area **13b**	704	704	704	704	704	704	--
14 General Forest							
Management Area **14a**	1,011,404	825,899	880,225	610,677	646,320	496,928	195,190
Management Area **14a**	--	--	--	597	661	597	--
15 Riparian [5]							
Management Area **15**	NA	50,637	47,993	45,389	50,552	47,991	43,600

[1] Wilderness Resource Spectrum management is not applicable to the No change Alternative.
[2] All alternatives include 1,207 acres of Wild and Scenic River designation (wild classification) in the Waldo Wilderness. These acres are included in Management Area 1.
[3] Includes Existing nest area habitat only.
[4] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres. Refer to Figure II-4 for total habitat acres by alternative.
[5] Riparian acres which are not included in other management areas with no programmed harvest are allocated to MA15. Harvest rates in these Riparian Management Acres differ between alternatives, as described in Chapter II, Riparian. Riparian acres in NC are distributed throughout other management areas.
[6] Alternative L recommends designation of 169,360 acres of roadless area as Wilderness or wilderness study areas.

Wilderness

The goal of managing dedicated Wilderness is to feature naturalness, provide opportunities for solitude, challenge, and inspiration, and within these constraints to allow for recreation, scenic, scientific, educational, conservation, and historical uses. Permitted but nonconforming uses specified in the Wilderness Act would be carried out under restrictions designed to minimize their impact on the Wilderness. The criteria used for conflict resolution would be to preserve and protect the Wilderness

resource. Consistent with providing a range of wilderness opportunities and experiences each Wilderness is divided into the following management areas based on the Wilderness Resource Spectrum.

MANAGEMENT AREA - 1a (Transition)

The Transition Wilderness Resource Spectrum Class that comprises this management area is characterized predominantly by conditions of relatively concentrated use where encounters with other groups are frequent, opportunities for solitude are limited, and user controls may be highly evident. This management area is usually adjacent to major wilderness entry points or day use destination areas.

MANAGEMENT AREA - 1b (Semiprimitive)

The Semiprimitive Wilderness Resource Spectrum Class that comprises this management area includes areas which are characterized by predominantly unmodified natural environments of moderate to large size; concentration of users may be low, but there would often be evidence of other users in the area; minimum on-site controls and restrictions may be present, but are subtle.

MANAGEMENT AREA - 1c (Primitive Trailed B)

The Primitive Trailed-B Wilderness Resource Spectrum Class that comprises this management area includes areas surrounding existing and proposed trails which provide a primitive trail associated Wilderness experience. These corridors are characterized by an essentially unmodified natural environment.

MANAGEMENT AREA - 1d (Primitive Trailed A)

The Primitive Trailed-A Wilderness Resource Opportunity Spectrum Class that comprises this management area includes areas which lie between developed and maintained trail systems that provide primitive Wilderness experiences. The user would have opportunities to travel cross- country, utilizing a maximum degree of outdoor skills, often in an environment of varied terrain and vegetation that offers a high degree of challenge and risk.

Oregon Cascades Recreation Area (OCRA)

The OCRA was established by Congress for the conservation of unique geographic, topographic, biological, and ecological features, to protect wildlife, recreation, and watershed values, and provide a variety of recreation experiences. Two management areas are identified within the OCRA.

MANAGEMENT AREA - 2a (OCRA Motorized)

This area provides the opportunity, within the OCRA, for users to experience a moderate degree of isolation from the sights and sounds of human activity, establish some sense of independence and closeness to nature, and develop a moderate feeling of self-reliance through the application of outdoor skills. These experiences are provided in an environment that offers some challenge and risk to both motorized and nonmotorized use.

MANAGEMENT AREA - 2b (OCRA Nonmotorized)

This area provides the opportunity, within the OCRA, for users to experience a high degree of isolation from the sights and sounds of human activity, establish a sense of independence and closeness to nature,

and develop some feelings of tranquility and self-reliance. Recreation activities associated with this intensity are nonmotorized and nonmechanical in nature except for over-the-snow use.

Experimental Forest

MANAGEMENT AREA - 3 (H.J. Andrews Experimental Forest)

The primary objective of this management area is research and study of the effects of management activities on a wide range of multiple use resources, including watershed, wildlife, and soil as well as the effects of silvicultural practices on growth rates and harvest yields of Douglas-fir.

Research Natural Areas

MANAGEMENT AREA - 4 (Research Natural Area)

The lands within this management area would be managed for preservation of examples of natural ecosystems for comparison with those influenced by human activity; education and research for ecologic and environmental studies; and preservation of gene pools for typical, rare, or endangered species.

This management area includes established and proposed Research Natural Areas (RNA). Establishment of RNAs is an administrative designation requiring approval by the Chief of the Forest Service. Additions to the RNA system proposed by any alternative would not be implemented until approved by the Chief.

Special Interest Areas

MANAGEMENT AREA - 5a (Special Interest Area)

These areas would be managed primarily for recreation use while maintaining unusual recreational, scenic, historical, geological, botanical, zoological, paleontological, or other special characteristics or features in their natural condition. Depending on the nature of the special features, management may be directed either toward protection activities or facility development for interpretation and viewing activities. Road and trail access may be provided in development areas and discouraged where necessary for site protection.

MANAGEMENT AREA - 5b (Special Interest Area-Ecological Area)

The primary emphasis of this management area is to protect and enhance the exceptional ecological values in the Hardesty Mountain - Mount June area on the southwestern border of the Forest. Nonconsumptive resource activities would be emphasized. Access would generally be restricted to roads outside the area and existing trails within the area.

Wild and Scenic Rivers

MANAGEMENT AREA - 6a (Wild and Scenic Rivers-Wild River)

This management area preserves the Wild River characteristics of the portion of the North Fork of the Middle Fork of the Willamette River that lies within the Waldo Wilderness. Emphasis would be on the preservation of the primitive characteristics and scenic qualities of the river segment and the corridor of lands on either side.

MANAGEMENT AREA - 6b (Wild and Scenic Rivers-Scenic River)

This management area would maintain or enhance the condition of the high quality scenery and condition of the generally undeveloped shore line along designated segments of the North Fork of the Middle Fork of the Willamette River and the McKenzie River. Management activities permitted within this area would include river-oriented recreation as well as programmed timber harvests that are compatible with Scenic river management objectives. Programmed harvests would generally not exceed 5% of the total acres per decade.

MANAGEMENT AREA - 6c (Wild and Scenic Rivers-Recreation River)

This management area would maintain or enhance the recreational and scenic values associate with the free-flowing condition of designated segments of the North Fork of the Middle Fork of the Willamette River and the McKenzie River. Management activities permitted within this area would include river-oriented recreation as well as programmed timber harvests that are compatible with recreation river management objectives. Programmed harvests would generally not exceed 7% of the total acres per decade. In Alternatives J and W, an alternate prescription which excludes programmed timber harvest is applied to the Recreation segments of the McKenzie River.

Old-Growth Grove

MANAGEMENT AREA - 7 (Old Growth Grove)

In this management area outstanding, highly accessible specimen groves of old-growth timber types of the Western Cascades are preserved. These areas are established primarily for the education, use, and enjoyment of the public, and they also provide habitat for a wide range of old-growth dependent plant and animal species. No programmed timber harvest is scheduled in this management area. Management activities are limited to those which protect the flora, fauna, and ecological character of the grove, and which provide aesthetic opportunities through the use of interpretive trails and adjacent developments.

T & E Species

MANAGEMENT AREA - 8 (Threatened and Endangered Species-Bald Eagle)

The management area provides for care and maintenance of active bald eagle nest sites in the Forest. Programmed timber harvest is not permitted, however, unregulated harvest is allowed to enhance bald eagle habitat within the management area.

Special Wildlife Habitat

MANAGEMENT AREA - 9a (Spotted Owl Habitat Area)

This management area protects mature and old-growth habitat for the northern spotted owl and other flora and fauna with similar habitat requirements by providing a habitat network for the northern spotted owl, an ecological indicator species. Primary emphasis is on meeting habitat requirements for the spotted owl. Programmed timber harvest is not permitted.

MANAGEMENT AREA - 9b (Pileated Woodpecker Habitat Area)

This management area protects mature and old-growth habitat for pileated woodpeckers and other flora and fauna with similar habitat needs by providing a habitat network for the pileated woodpecker,

an ecological indicator species. Programmed timber harvests are not permitted in designated habitats. In Alternative W, core habitat areas within management areas with 150 to 200 year rotations would have programmed harvests located and scheduled in a manner that meets habitat requirements.

MANAGEMENT AREA - 9c (Pine Marten Habitat Area)

This management area protects mature habitat and old-growth for pine martens and other flora and fauna with similar habitat requirements by providing a habitat network for the pine marten, an ecological indicator species. Programmed timber harvest is not permitted. In Alternative W, core habitat areas within management areas with 150 to 200 year rotations would have programmed harvests located and scheduled in a manner that meets habitat requirements.

MANAGEMENT AREA - 9d (Special Wildlife Habitats)

This management area maintains and enhances special wildlife habitats and small botanical sites which are important to a biologically diverse ecosystem. Examples of the types of areas included are meadow complexes, cliffs, elk wallows, and talus. Only activities that benefit the featured species or habitat would be permitted. Programmed timber harvest is not permitted. Facilities or improvements for recreation or viewing may be provided if compatible with the wildlife objectives.

Dispersed Recreation

MANAGEMENT AREA - 10a (Dispersed Roaded Natural Recreation)

This management area is for dispersed roaded natural recreation opportunities, wildlife habitat, and timber resource values as well as for other multiple-uses and resources. Timber harvest in this management area would occur at a maximum rate of 10% of the suitable/available land each decade. Activities associated with this management area are motorized and nonmotorized in nature.

MANAGEMENT AREA - 10b (Dispersed Semiprimitive Motorized Recreation)

This management area manages areas within the Forest for their dispersed semiprimitive motorized recreation opportunities, wildlife habitat, and timber resource values as well as for other multiple uses and resources. Timber harvest in this management area would occur at a maximum rate of 7% of the suitable/available land each decade. Activities associated with this intensity are both motorized and nonmotorized in nature.

MANAGEMENT AREA - 10c (Dispersed Semiprimitive Motorized Recreation, No Harvest)

This management area manages Forest lands for their dispersed semiprimitive motorized recreation opportunities and wildlife habitat, as well as for other multiple uses and resources. Programmed timber harvest is not permitted within this management area. Timber harvest may be permitted to enhance recreational use within the area. Activities associated with this management area are both motorized and nonmotorized in nature.

MANAGEMENT AREA - 10d (Dispersed Semiprimitive Nonmotorized Recreation)

This management area manages Forest lands for their dispersed semiprimitive nonmotorized recreation opportunities, wildlife habitat, and timber resource values as well as for other multiple uses and resources. Timber harvest in this management area would occur at a maximum rate of 5% of the suitable/available

land each decade. Recreation activities associated with this management area are exclusively nonmotorized and nonmechanical in nature.

MANAGEMENT AREA - 10e (Dispersed Semiprimitive Nonmotorized Recreation, No Harvest)

This management area provides for the management of Forest lands for their dispersed semiprimitive nonmotorized recreation opportunities and wildlife habitat as well as for other multiple uses and resources. Programmed timber harvest is not permitted within this management area. Recreation activities associated with this management area are exclusively nonmotorized and nonmechanical in nature.

MANAGEMENT AREA 10f (Lakeside Habitats)

This management area provides for the management of Forest lakeside areas for their wildlife habitat, recreational and scenic values. Access within and through the areas would be limited to existing roads and trails. Programmed timber harvest is not permitted. Facilities development for recreation would be limited to that necessary for site protection and would be compatible with wildlife habitat objectives.

Scenic

These management areas provide for management of the Forest landscape for its value as a scenic resource as well as for other multiple uses and resources. A broad range of silvicultural practices is permitted.

MANAGEMENT AREA - 11a (Scenic Modification - Middleground)

Management of the area provides that activities within middleground zones of visually sensitive landscapes, as viewed from major travel corridors and use areas, may visually dominate the landscape but must borrow from natural characteristics in the surrounding area. The size and configuration of harvest areas must conform to standards for meeting the modification middleground Visual Quality Objective.

MANAGEMENT AREA - 11b (Scenic Modification - Foreground)

Management of the area provides that activities within foreground zones of visually sensitive landscapes, as viewed from major travel corridors and use areas, may visually dominate the landscape but must borrow from natural characteristics in the surrounding area. The size and configuration of harvest areas must conform to standards for meeting the modification foreground Visual Quality Objective.

MANAGEMENT AREA - 11c (Scenic Partial Retention - Middleground)

Management of the area provides that activities within middleground zones of visually sensitive landscapes, as viewed from major travel corridors and use areas, may be evident but must remain visually subordinate. The size and configuration of harvest areas must conform to standards for meeting the partial retention middleground Visual Quality Objective.

MANAGEMENT AREA - 11d (Scenic Partial Retention - Foreground)

Management of the area provides that activities within foreground zones of visually sensitive landscapes, as viewed from major travel corridors and use areas, may be evident but must remain visually subordinate.

The size and configuration of harvest areas must conform to standards for meeting the partial retention foreground Visual Quality Objective.

MANAGEMENT AREA - 11e (Scenic Retention - Middleground)

Management of the area provides that activities within middleground zones of visually sensitive landscapes, as viewed from major travel corridors and use areas, would not be visually evident to many observers. The size and configuration of harvest areas must conform to standards for meeting the retention middleground Visual Quality Objective.

MANAGEMENT AREA - 11f (Scenic Retention - Foreground)

Management of the area provides that activities within foreground zones of visually sensitive landscapes, as viewed from major travel corridors and use areas, would not be visually evident to many observers. Configuration of harvest areas must conform to standards for meeting the retention foreground Visual Quality Objective.

Developed Recreation

MANAGEMENT AREA - 12a (Developed Recreation Area, Public-Existing and Proposed)

This management area includes areas of land where physical improvements have been provided for a range of developed recreation opportunities as well as lands that are reserved for future study and potential development for a variety of developed recreation facilities.

MANAGEMENT AREA - 12b (Developed Recreation Area, Private-Existing or Proposed)

This management area includes areas of the Forest that are currently under special use permits or have potential as special use sites. Sites under special use permits with facilities, services, and opportunities provided by the private sector would be maintained according to the terms of individual special use agreements.

Special and Administrative Uses

MANAGEMENT AREA - 13a (Long-term Special Use Sites)

This management area applies to those lands where an existing major, long- term special use is currently under permit. These are generally non-recreational facilities such as repeater stations.

MANAGEMENT AREA - 13b (Forest Administrative Sites)

This management area is applicable where facilities and/or resources for the protection, administration, or management of the Forest are provided and maintained.

General Forest

MANAGEMENT AREA - 14a (General Forest)

This management area emphasizes sustained production of timber while meeting multiple use objectives for other resources as outlined in Forest-wide standards and guidelines. In most areas an extensive road network would be required to facilitate the objectives of this management area. Each management

intensity, applied to suited forest land, within this management area represents a specific set of practices, standards, and guidelines which are responsive to individual site capabilities, and include a full range of silvicultural systems and harvest methods.

MANAGEMENT AREA - 14b (General Forest, Deferred)

This area includes approximately 600 acres near Hardesty Mountain on the southwest side of the Forest. No timber harvest is programmed from this area for the planning period to allow additional studies of the relationship of the area to Management Area 5b. Silvicultural activities other than harvesting would occur as needed to meet sustained yield objectives of Management Area 14a.

Riparian

MANAGEMENT AREA - 15 (Riparian)

This management area is applicable to rivers, streams, small wetlands, lakes and the adjacent riparian areas. The emphasis in this area is to maintain the role and function of riparian areas in the overall landscape ecology. Activities within this management area vary by alternative, with no programmed timber harvest is permitted in Alternatives W and L; some harvest along Class III streams in Alternative D; and the MR prescription would be applied in Alternatives NC, K, A, and J. The MR prescription is described in the standards and guidelines of FEIS Appendix D.

MANAGEMENT AREA ADJUSTMENTS, Alternative L

Alternative L, developed with input from Oregon Natural Resources Council, uses several management area prescriptions that vary from the preceding descriptions. Although the specific emphasis for some of the prescriptions in Alternative L differ from the management area prescriptions in other alternatives, the modelling constraints and ultimate effects on other resources are similar in many cases. To make the analysis of Alternative L comparable with the other alternatives, the prescriptions unique to Alternative L for a particular emphasis were evaluated by the IDT for similarities of constraints and effects with existing management area prescriptions. Once similarities were identified, the management area prescriptions in Alternative L were correlated to the existing management area prescriptions and descriptions for comparability in mapping and modelling. In a few management areas the maximum allowable harvest rates by decade were adjusted to meet the intent of Alternative L.

The management area adjustments used to model Alternative L were:

Alternative L	**Management Area Used**
Wilderness-Recommended	1c
Wilderness-Study	1c
Old Growth Reserve	7
Old Growth Management	7
Old Growth Replacement	11f
Wildlife Habitat-Critical	9d
Wildlife Habitat-Sensitive	9d
Watershed-Critical	10c
Watershed-Sensitive	10b
Riparian Reserve	15

Riparian Management	11f
Rehabilitation-Natural	10b
Rehabilitation-Enhancement	10c
Back Country	10e
Scenic Preservation	10c
Timber Management-Extensive	11a
Timber Management-Intensive	14a
Mixed Rotation-No Harvest	7
Mixed Rotation-160 years	11e
Mixed Rotation-80 years	11c
Wild Lakes	10f

Following is a brief description of the general emphasis and intent of the management areas unique to Alternative L.

Wilderness Recommendation (149,203 acres) - Lands that the Forest Service would recommend to Congress for Wilderness classification.

Wilderness Study Areas (20,178 acres) - Areas which would be studied intensively for their Wilderness attributes and characteristics. Generally includes lands with potential Wilderness quality, which require study before appropriate boundaries and recommendations can be determined. Road closures and certain types of rehabilitation could be considered in the study. The actual study would be a separate document from the Final Forest Plan, to be compiled and scrutinized during the life of the Forest Plan itself. The decision as to final allocation would then occur in the "next" Forest Plan. These areas would be managed in their existing condition, and removed from the commercial forest land base.

Wild Lakes (341 acres) - Similar to Back Country for standing water bodies which, because of surrounding development, are not eligible for inclusion in larger Back Country or Wilderness Recommendation allocations. Keeps lakes in status quo or better conditions such as by prohibiting motorized traffic. In general, no additional development or access.

Old-Growth Reserve (136,555 acres) - Specific areas for no-cut management. The old-growth forest would age naturally. The Reserve can be any size and can include Spotted Owl Habitat Areas.

Old-Growth Management Areas (15,102 acres) - Long-rotation management areas, where 10-20% of the potential yield is expected. At least 3/4 of the entire area must actually be in an old-growth forest condition (250 years plus) at any one time. Areas not currently meeting this criteria can be allowed to grow into the desired condition. Cutting would be either by clearcutting (patch-cutting) small areas (40 acre maximum), or by selective systems. Helicopter and balloon systems preferred, with minimal road networks. Roads to be closed after sales.

Old-Growth Replacement - Extended Rotations (98,075 acres) - Long rotation management areas located in blocks of old-growth larger than 300 acres. The timber would be managed on 80 and 160 year rotations, with enough trees at 240 years old to provide functional Old Growth characteristics.

Wildlife Habitat - Critical Areas (192 acres) - Designation which emphasizes the critical nature of these areas in terms of survival cover, winter range, etc, by minimizing disturbance. Timber cutting is not programmed, and very few circumstances would require or allow any cutting at all. No new roads; existing roads may or may not be closed, either within the specific land use allocation decision or later as a consequence of its management plan.

Wildlife Habitat - Sensitive Areas (40,911 acres) - Same as Wildlife Habitat-Critical but applicable in areas where habitat conditions allow some disturbance. Some timber cutting allowed. About 10-15% of potential yield can be expected. No new roads, and road closures may be appropriate.

Watershed - Critical Areas (6,484 acres) - Designation which emphasizes the critical nature of these areas in terms of unstable soils, by minimizing disturbance. Timber cutting is not programmed, and very few instances would require or allow any cutting at all. No new roads; existing roads may or may not be closed, either within the specific land use allocation decision or later as a consequence of its management plan.

Watershed - Sensitive Areas (3,541 acres) - Same as Watershed Critical, but applicable in areas where watershed allows some disturbance. Some timber cutting allowed. About 10-15% of potential yield can be expected. No new roads, and road closures may be appropriate.

Riparian Reserve (3,903 acres) - Streamside areas which would be provided maximum protection by a no-cut, no roads allocation. Can be of any size. Usually would designate at least 250 feet on either side of stream. Adjacent developed land must be "feathered."

Riparian Management Areas (11,945 acres) - Streamside areas with a 100 foot no-cut buffer, (each side of the stream) then 200 feet at 25% yield. Riparian values, including large woody materials and largest conifers, would remain intact. Managed adjacent lands would be feathered to minimize blowdown. The remaining acres of riparian areas are distributed throughout other management areas which have no scheduled timber harvest.

Rehabilitation - Natural (30,587 acres) - Developed lands which would be allowed to revert to a natural condition by simply leaving them alone. May be used to simply recover that site, or help block up a larger expense of otherwise undeveloped, natural land.

Rehabilitation - Resource Enhancement (4,266 acres) - Same as Rehabilitation - Natural, except that more active on-the-ground management for watershed or wildlife habitat improvement. Especially appropriate for devastated pieces of ground where erosion is a serious factor or threat. Examples of activities would be extensive plantings, burning, and gabions.

Backcountry (88,797 acres) - Administratively-protected "wild" areas, which would be managed as Wilderness, but usually excluding grazing and mining. All other multiple uses (except logging) such as wildlife, fisheries, watershed, outdoor recreation, education, and research would be allowed and encouraged. No roads, and usually no ORVs. Proposed management activities following catastrophic evens would be carefully evaluated at the time. Catastrophic entry permitted, but only after careful scrutiny and approval.

Scenic Preservation Areas (27,324 acres) - For the most sensitive visual zones. This allocation allows no programmed harvest, and cutting can occur only in rare situations where safety or visual quality can indeed be improved. Must meet Forest Service Visual Quality Objective (VQO) of Preservation.

Extensive Timber Management Areas (36,474 acres) - Lands dedicated primarily to timber production, but without investments of intensive management techniques other than replanting and thinning. Yield of 85-95% is anticipated.

Intensive Timber Management Area (182,414 acres) - Similar to extensive, but applicable to lands dedicated to timber production. Intensive management techniques include genetic manipulation, more intensive thinning and replanting, irrigation, fertilization, and other methods, if proven to be cost-effective.

Mixed Rotation Management Areas (322,872 acres) - Old Growth islands of 80-300 acres comprise about 20% of this management area and are subject to no harvest. Another 20% provides connecting corridors between old-growth blocks and are managed on 160 year rotation. The remaining 60% of the area would continue on 80 year rotations, with a 10% reduced yield to provide structural old-growth characteristics that carry over into the next rotation.

Timber

Timber Resource Management Information - Management of the timber resource differs by alternative, depending on the mix of suited acres within management areas that allow timber harvest. Management areas with programmed timber harvest are: General Forest; scenic Retention, Partial Retention and Modification; Dispersed Recreation; and Scenic and Recreation Rivers. General Forest provides for the highest level of timber outputs, bound only by broad, watershed level constraints for dispersion, wildlife habitat and water quality. The other management areas emphasize nontimber resource values (e.g., scenic quality and recreation) resulting in lower levels of timber output. The acres allocated by management area are shown in Table II-3.

Lands suitable for timber production are the base from which the Allowable Sale Quantity (ASQ) is calculated. While trees can be cut and removed from some lands unsuitable for timber production in certain specific cases (e.g., to provide forage), the amount does not contribute to the ASQ. Additional volume not reflected in the ASQ includes cull and salvage material. The total timber sale program for the Forest is referred to as the Timber Sale Program Quantity (TSPQ).

The Forplan analysis and projections for future timber outputs use cubic volume measure. Historic volume data and volumes projected for harvest by alternative in the next decade are also displayed in board foot measure. An industry-wide transition from board foot to cubic measure is expected within the next decade, so volumes are shown in board feet for only the first decade. As the mix of species and size classes harvested varies over time, the board foot volume varies even though the cubic volume remains constant. The board foot/cubic foot ratio will decline over time as the average diameter of stands harvested becomes smaller. Alternative W harvests a constant 87 MMCF per year for the first five decades, while the resulting board foot volume declines from 491 MMBF in decade 1, to 440 MMBF by decade 5. This trend occurs under all alternatives.

Timber resource inventory and management data are presented in Table II-4; (note that an explanation of the columns in the display is provided in the following paragraphs). This display is followed by discussions of land suitability for timber production, timber volumes offered for sale, long-term sustained yield, silvicultural activities, and comparisons with the current Plan.

Table II-4 and the following narrative provide an understanding of how and why differences in timber resource data occur and their interaction with other resources as objectives vary from alternative to alternative.

Table II-4. Timber Resource Management Information

	Suitable Lands	Inventory			1st Decade Average Annual ASQ			LTSYC			Average Annual Net Growth		
		Begin	Begin/ Ac	End									
Benchmark or Alternative	M Acres	MMCF	CF	MMCF	MMCF	% Col.2	MMBF	MMCF	% Col.4	Decade	CF/Ac Begin	CF/Ac Dec5	MMCF Dec5
Benchmark	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Max Timber	928.0	5,180.8	7,376	3,694.5	121.5	2.3%	673	126.4	3.4%	7	81	132	122.3
Max PNV	918.8	5,173.0	7,373	3,678.1	120.1	2.3%	684	120.2	3.3%	15	77	119	109.6
Alternatives													
NC (No Change) [3]	1,064.6	NA	NA	NA	146	NA	810	146	NA	1	NA	NA	NA
K	932.8	5,076.7	7,430	4,212.4	117	2.3%	650	120.0	2.8%	98% [2]	91	123	112
A	874.3	4,743.2	7,455	3,976.6	110	2.3%	608	113.5	2.9%	15	84	122	105.9
J	853.4	4,435.6	7,534	4,005.1	95	2.1%	530	107.8	2.7%	9	97	125	102.8
W	774.6	3,813.3	7,301	3,147.5	87	2.3%	491	94.7	3.0%	13	90	124	88.9
D	719.4	3,428.4	6,890	3,329.6	86	2.5%	476	93.8	2.8%	98%	97	127	91.0
L	553.1	1,635.3	6,974	2,335.2	27	1.7%	150	34.2	1.5%	97%	57	103	33.9

	Area and Percent of Suitable Land by Yield Level						1st Decade			
	Full Yield		50-94% Yield		Under 50% Yield		Clearcut	Shelterwood/Seed Tree	Selection	Harvest Total
Benchmark or Alternative	M Ac	% Col.(1)	M Ac	% Col.(1)	M Ac	% Col (1)	M Acres	M Acres	M Acres	% Col (1)
Benchmark	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
Max Timber	885.3	95%	42.7	5%	0	0	123	9	0	14%
Max PNV	876.5	95%	42.3	5%	0	0	122	9	0	14%
Alternatives										
NC (No Change)	918.7	86%	145.9	14%	0	0	134	10	0	14%
K	797.0	85%	135.8	15%	0	0	117	9	0	14%
A	743.4	85%	130.9	15%	0	0	113	8	0	14%
J	719.6	84%	133.8	16%	0	0	95	7	0	12%
W	689.2	89%	85.4	11%	0	0	85	6	0	12%
D	638.9	89%	80.5	11%	0	0	92	7	0	14%
L	314.3	57%	163.9	30%	74.9	13%	31	2	0	6%

Existing Timber Management Plan

Data from the Timber Management Plan (TMP):

a. Potential yield in cubic feet and board feet: 850.4 MMBF (156 MMCF @5.45). This includes 53 MMBF of salvage.
b. Average annual net volume sold during years TMP was in effect: 623 MMBF (77-89), (114 MMCF @5.45).
c. Total acres of standard, special, and marginal lands used to develop the potential yield: 1,064,616 Acres.

[1] Tentatively suitable lands for all Alternatives, except NC: 1,032,100 acres, with a present inventory of 5,835 MMCF.
[2] Percent of long-term sustained yield (LTSY) reached by end of planning horizon (decade 15).
[3] NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Forest FORPLAN model. Section D4b, of Chapter II in the DEIS describes these differences.

Column 1 -- The suitable acres displayed here reflect the difference in land allocations between Alternatives. Alternative NC represents the Current TM Plan and differs from the other Alternatives and benchmarks in managing 125,000 acres of marginal land for full yield and includes no consideration of MRs. This marginal category is no longer used, most of it becoming "unsuited" in the new landbase classification. The other Alternatives are compared as follows: With a few minor exceptions (old-growth groves, research natural areas, etc.), variation in total suitable acres is a function of roadless recreation and wildlife habitat areas. Suitable acres decline from Alternative K, to A, to J and W, due to additional acres in roadless areas. The decline continues from D to L as more roadless areas and Spotted Owl Habitat Areas are added.

Columns 2, 3, and 4 -- The beginning inventory (2) is proportionate to suited acres. The beginning volume/acre (3) increases from Alternative K, to A, to J as low volume/acre roadless areas are removed from the base. From this point the volume/acre decreases to W, L, and D as riparian areas, additional roadless areas, and Spotted Owl Habitat Areas, with higher volumes per acre are removed, thus reducing the volume/acre on the remaining timber base. Alternative L includes a greater proportion of high volume/acre stands than D.

The inventory volume at the end of 150 years (4) is a function of the suitable acres, age class distribution, and management intensities. The Alternatives are generally in the order of suitable acres except for J and D which include different mixes of age classes and management intensities, resulting in slightly more ending inventory volume than the number of suited acres would suggest.

Columns 5, 6, and 7 -- The first decade ASQ (5 & 7) is highly dependent on the size of the suitable landbase. Alternative K has the highest ASQ followed by A, J, W, D, and L. The ASQ as a percent of the beginning inventory (6) depends on the mix of rotation ages which are a function of species and management intensity. Most of the alternatives are at about 2.3%, but J and L, with higher proportions of long-rotation management areas are at 2.1 and 1.7% respectively.

Columns 8, 9, and 10 -- The LTSYC (8) is generally a function of suitable acres, species (as a surrogate for site index), and management intensity. The order of the alternatives is the same as for suited acres. As a percent of the ending inventory (9), LTSYC follows about the same pattern as ASQ % of the beginning inventory in Column 6. Alternatives J and L, with less intensive management due to the higher proportion of long-rotation management areas, harvest a smaller percentage of the ending inventory. Most alternatives reach LTSYC by the 15th decade (10), but three alternatives (K, D and L) fall short by 2 to 3%, due to age class distributions which are still uneven. Alternative NC avoids future volume shortages associated with uneven age class distributions by harvesting over half the ASQ volume in commercial thinnings in the fifth decade and beyond, so that first decade ASQ is equal to LTSYC.

Columns 11, 12, and 13 -- The average annual net growth per acre at the present time (11) is mostly a function of site index and age class on the suited landbase. Five decades in the future (12), the growth rate increases dramatically as most of the existing mature and old growth stands have been replaced by young, fast growing stands. Alternative L has the least growth per acre because of the higher proportion of long-rotation lands, which delays the conversion from existing to managed stands. The total annual growth in the year 2030 (13), reflects the number of acres in the suited landbase.

Columns 14 to 19 -- In total acres of full yield (14), the alternatives follow the same order as total acres of suitable lands, but as a percentage of the suited lands (15), are more variable and depend on the objectives of the alternative. The reduced yield lands which range from 50% to 94% of full yield (16) have a similar pattern except for Alternative L which has a much higher

proportion of reduced yield lands. There are no suitable acres being managed at less than 50% of full yield (18), except in Alternative L which has management areas with rotations as long as 666 years.

Columns 20 to 23 -- The number of acres clearcut (20) are in the same order as the acres in the suited landbase and volume harvested. The only exception is Alternative D, which harvests a higher ratio of small sawtimber, giving it more acres than Alternative W. Regeneration harvest other than clearcut (21) assumes future use of shelterwood and seed tree cutting will be at about the same proportion (7%) as past use. The acres of selection harvest (22) are modeled at zero, although this option is available to be prescribed.

Based on the percent harvested in the first decade (23), the various alternatives would take about 63 to 100 years to cut over the suitable landbase. The actual time will be longer because of harvest rate constraints, which on some areas require a rotation age of up to 666 years, and the increasing amount of commercial thinning volume which will reduce the number of clearcut acres in future decades.

Suited Acres - Table II-5 compares suited lands and timber yield categories by Alternative. There are 1,032,318 acres on the Forest that are tentatively suitable for timber management (See Chapter III, Timber). Removal of 85,513 acres necessary to meet management requirements (MRs) leaves a potential landbase for timber management of about 946,800 acres. The MR acres include Spotted Owl habitat (74,719 acres), and riparian areas that cannot be harvested due to steep and/or unstable soils (10,794 acres). Pine Marten and Pileated Woodpecker MRs are met in some alternatives by managing larger areas on long rotations, so these acres are still part of the potential landbase for timber management. Alternative K produces timber from 99% of the potential landbase, followed by A (92%), J (90%), W (82%), D (76%), and L (55%). Alternative NC which does not include MRs, and schedules harvest on 125,000 acres of "marginal" lands, has a suitable landbase of 1,064,616 acres, 12% greater than the potential landbase for the other alternatives.

Table II-5 also shows the breakdown of the suited acres by percent of full yield expected under the proposed management intensities. Also shown are the rotation ages that go along with the yield constraints. At full yield the rotations vary from 60 to 110 years, depending on species, access for commercial thinning, and response to fertilizer. The acres with 75 to 94% of full yield have 140 year rotations that result from harvest rate constraints that limit the amount of regeneration harvest to 7% of the suited acres per decade. The acres with 50 to 74% of full yield have 200 year rotations resulting from a harvest rate constraint of 5% per decade. Alternative L has additional constraints as low as 1.5% per decade, resulting in rotations as long as 666 years.

Table II-5. Comparison of Suited Timberlands

					Timber Yield Acres with Yield Reductions to Meet Other Resource Objectives					
Alternative	Acres with Timber Yield	% of Tent. Suited -MRs[1]	No Yield	% of Tent. Suited - MRs	Acres of Full Yield [2]	%	75-94% Full Yield	%	50%-74% Full Yield	%
NC (No Change)[3]	1,064,616	112%	0	0	918,657	86%	54,000	5%	91,959	9%
K	932,813	99%	13,992	1%	796,974	85%	70,306	8%	65,533	7%
A	874,291	92%	72,514	8%	743,451	85%	71,236	8%	59,604	7%
J	853,398	90%	93,407	10%	719,610	84%	72,556	9%	61,232	7%
W	774,608	82%	172,197	18%	689,229	89%	42,870	6%	42,509	5%
D	719,439	76%	227,366	24%	638,929	89%	40,425	6%	40,085	5%
L	553,090	58%	393,715	42%	314,299	57%	74,857	14%	163,938[4]	29%
Rotation Age					60-110 years		140 years		200 years	

[1] Suited acres minus MRs = Total Forest acres (1,675,407) - nonforest acres (146,153) - withdrawn acres (327,501) - roads and unsuited acres (169,615) = 1,032,138 acres tentatively suited - acres required for resource management objectives (36 CFR 219.14 (c)) which preclude timber production (85,513) = 946,805 acres.

[2] Full yield is that developed in a yield simulator, less operational falldown, without further reductions for other resource considerations, and available for harvest at CMAI (or 95% CMAI).

[3] Alternative NC has the same land allocations as Alternative A (No Action) but is based on different land suitability standards and does not include MRs. It also assumes the necessary budget, workforce and technology will be available to produce full timber yields from 125,000 acres of "marginal" land.

[4] This table includes 74,941 acres that are managed on rotations of 330 to 660 years, with timber outputs that are less than 50% of full yield.

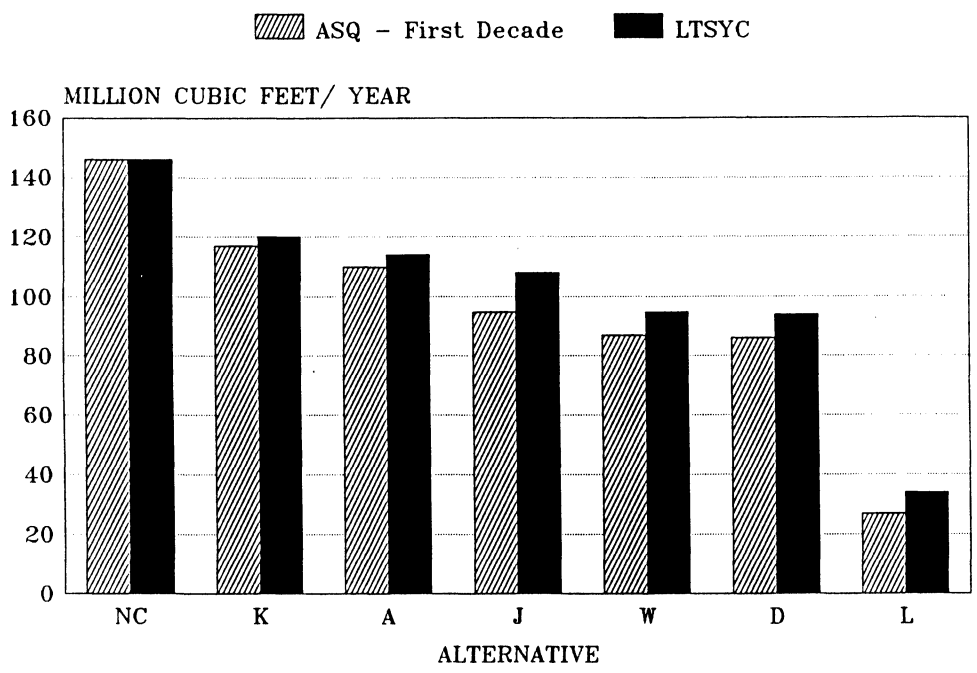
Volume - Timber volumes are measured in several different ways to reflect different aspects of the timber program. The Allowable Sale Quantity (ASQ) measures the amount of sound, green or recently dead wood that can be sold in a decade, and is the amount used for controlling the Forest's timber sale program. The ASQ is calculated in cubic feet using FORPLAN. The cubic foot measurement is used because it is a more accurate measure of total merchantable volume, especially over the long term. It reflects the increasing utilization of the tree much better than is possible with board foot measures. The long-term sustained yield capacity (LTSYC) is also measured in cubic feet and calculated using FORPLAN. Alternative NC, developed under the current plan, used a computer program called Timber RAM (Resource Allocation Method) to calculate ASQ and LTSYC.

Long-term sustained yield capacity measures the amount of volume that can be grown and harvested on a sustained basis from future stands. Figure II-1 displays the long-term sustained yield capacity and ASQ in cubic feet for the alternatives. In addition to the ASQ, volume from cull material, salvage sales, and miscellaneous materials and products is also sold by the Forest. This additional volume was determined by averaging the annual volumes from the past decade. The total volume sold, including the ASQ, is termed the Timber Sale Program Quantity (TSPQ). Figure II-2 displays the TSPQ and ASQ in board feet for the alternatives. Firewood availability is measured by the potential cords of

available cull material from timber sales. Figure II-3 shows the potential firewood available for the Alternatives.

All four of these measures follow the same pattern in the alternatives, and vary directly with the number of suitable acres. Alternative NC, with the largest landbase, has the highest ASQ, TSPQ, LTSYC and most cords of firewood available. Alternative K has the next highest levels of outputs, followed in order by Alternatives A,J,W,D and L.

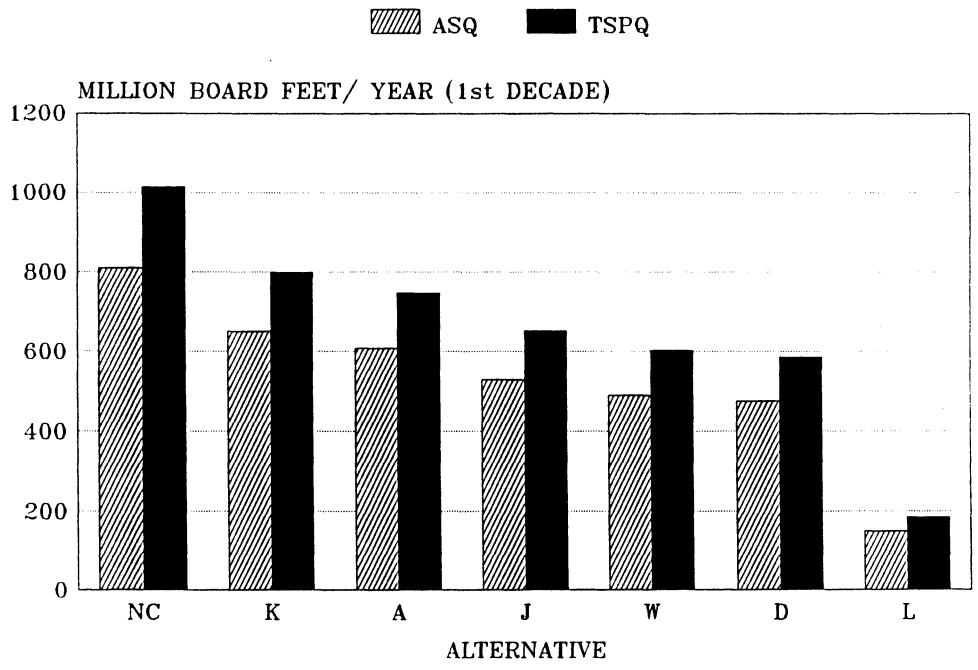
Figure II-1. Allowable Sale Quantity and Long-term Sustained Yield Capacity



	Alternatives						
	NC	**K**	**A**	**J**	**W**	**D**	**L**
ASQ [1] - 1st Decade (MMCF)	146	117	110	95	87	86	27
LTSYC [2] (MMCF)	146	120	114	108	95	94	34

[1] Allowable Sale Quantity
[2] Long-term sustained yield capacity

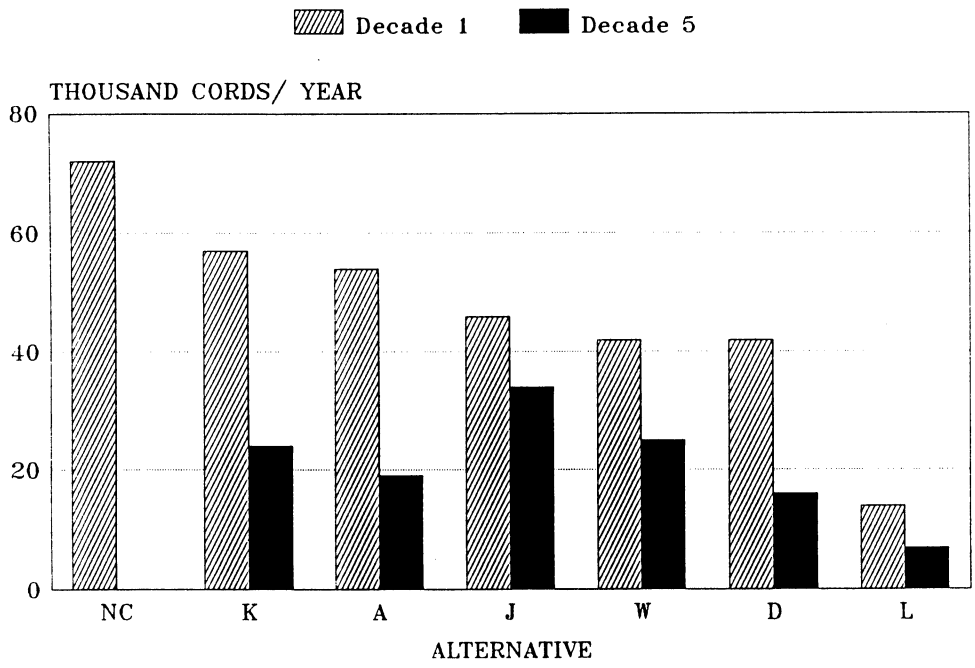
Figure II-2. Allowable Sale Quantity and Timber Sale Program Quantity



	Alternatives						
	NC	**K**	**A**	**J**	**W**	**D**	**L**
ASQ [1] (MMBF)	810	650	608	530	491	476	150
TSPQ [2] (MMBF)	1,013	799	748	652	604	586	185

[1] Allowable Sale Quantity
[2] Timber Sale Program Quantity

Figure II-3. Potential Firewood Availability [1]



	Alternatives							
Unit of Measure	**Decade**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
MCORDS/yr	1	72	57	54	46	42	42	14
MCORDS/yr	5	NA[2]	24	19	34	25	16	7

[1] Projections for firewood supply are based on historical proportions of cull volume used as firewood and do not include the piling unmerchantable material (PUM) or other potential sources such as precommercial thinning slash.
[2] NA= Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Forest FORPLAN model. Section D4b, of Chapter II in the DEIS describes these differences.

Silvicultural Activities - A mix of silvicultural treatments is applied to the acres which are suited for timber management. The silvicultural activities used in the alternatives include reforestation, release, precommercial thinning, fertilization, commercial thinning, and regeneration harvest. The difference between alternatives is the number of acres to which these treatments are applied, which reflects the number of suitable acres and how many are accessible for commercial thinning. These activities are displayed in Table II-6.

Table II-6. Annual Silvicultural Treatments

		Alternatives						
Treatment (M Acres)	**Decade**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Regeneration Harvest and Reforestation	1	14.4	12.6	12.1	10.2	9.1	9.9	3.3
	5	NA[1]	11.8	11.6	8.2	8.1	8.5	2.3
Release	1	2.2	2.5	2.4	2.0	1.8	2.0	0.7
	5	NA	2.4	2.3	1.6	1.6	1.7	0.5
Precommercial Thinning	1	10.7	8.6	9.5	6.6	6.7	7.1	1.8
	5	NA	9.2	8.7	7.3	6.8	7.0	2.3
Fertilization	1	0	10.2	8.8	11.8	9.6	10.2	5.6
	5	0	10.1	10.7	7.7	7.3	6.8	2.6
Commercial Thinning	1	4.2	3.1	3.2	2.6	2.8	2.7	0.2
	5	NA	2.8	1.3	10.1	6.8	6.1	4.9

[1]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Forest FORPLAN model. Chapter II (Timber) in the FEIS describes these differences.

Comparison of Past, Present, and Projected Future Outputs - Table II-7 provides a comparison of the current Timber Management Plan potential yield, average volume sold, average volume cut, and the proposed alternatives for the Forest Plan. This table also breaks out the various components of the Timber Sale Program Quantity (TSPQ) for each of the alternatives.

Table II-8 compares the Forest situation from the Potential Yield of the Current Plan in 1977, to the No Action Alternative which incorporates NFMA regulations, and finally to the Preferred Alternative (W). The following discussion explains the differences found in these comparisons in two steps. The first step compares the Current Plan (Alternative NC) to the No Action Alternative (A) under NFMA, to highlight the changes due to implementation of the NFMA regulations. The second step compares the No Action Alternative to the Preferred Alternative (W), to highlight the changes in response to the issues facing the Forest today.

The potential timber yield of the Current Plan was 897 million board feet (MMBF) in 1977. This amount was amended twice to 850 MMBF due to the addition of new wilderness in 1980 and 1984. In addition, 40 MMBF of salvage was removed to provide comparisons based on net green volumes. This results in a Current Plan potential yield of 810 MMBF (Alternative NC). By comparison, the potential first decade yield for the Current Plan, as it would be implemented under the NFMA planning process, is 608 MMBF (Alternative A). The difference of 202 MMBF can be attributed to two factors: fewer acres suited for timber management; and less productivity per acre.

The biggest factor (72%) is the drop in suited acres from 1,064,616 to 874,290 which accounts for 145 MMBF at the average Forest productivity rate of 761 board feet per acre per year. The difference of 190,330 acres is due to changes in land suitability definitions, additional nonforest acres due to more detailed timber typing, and wildlife and riparian MRs.

The remaining factor (28%) is the reduction in Forest productivity. This is due to a combination of yield table differences and management intensities. The overall productivity dropped from 761 board feet/acre/year in the current TM Plan to 695 board feet under the new calculations, and accounts for a drop of 57 MMBF on 874,290 acres. Even though individual yield tables dropped by as much as 12% from those used previously, the loss was offset somewhat by the addition of fertilizer to stands with at least 60% Douglas fir.

The discussion thus far has examined the effects of implementing the Current Plan under the NFMA regulations. The second step is to compare the Current Plan under NFMA (Alternative A) with implementation of the Preferred Alternative (W). The Preferred Alternative allocates an additional 99,690 acres to no-harvest categories (e.g., riparian habitat, dispersed recreation, special interest areas, old-growth groves, and special wildlife habitat) to deal with the issues facing the Forest today. This amounts to a 69 MMBF drop in potential yield. There is also an additional 48 MMBF drop due to changes in management intensity. These changes reflect more restrictive harvest rate constraints to meet resource objectives. The total of 117 MMBF is the volume reduction from the Current Plan (NFMA) potential yield of 608 MMBF to the Preferred Alternative potential yield of 491 MMBF. The total drop from the Current Plan (1977) potential yield (810 MMBF) to the Preferred Alternative (491 MMBF) is 319 MMBF. About 63% of this total drop is due to implementing the NFMA regulations, and 37% is due to land allocation changes in the Preferred Alternative to deal with Forest issues (See Table II-8).

The Current Plan proposed harvest level, excluding salvage, was set at 605 MMBF per year in 1977 and reflected a lack of funding, work force, and technology to realize the full potential yield. This volume has been revised downward periodically to account for changes in the land base due to Wilderness, and increased periodically for the earned harvest effect of intensive management above the level planned. This earned harvest effect results from the accomplishment of more acres of intensive management (pre-commercial thinning, etc.) than was planned, which increases the amount of future volume available for harvest, and in turn, increases the volume that can be harvested now without violating non-declining yield. The earned harvest effect has more than offset the decreased land base and the most recent adjustment shows the proposed harvest for the Current Plan at 645 MMBF annually. The actual amount sold has averaged 623 MMBF (97%) and the amount harvested 538 MMBF (83%) from 1977 through 1989.

The reason the amount harvested was less than the amount sold was because of the 1980s recession. A severe depression of the housing market and a general slowdown in the economy caused timber prices and demand to decline sharply. Timber harvest on the Forest fell to 370 mmbf in 1982, the lowest level since 1952. In order to remain competitive, mills harvested only the lowest priced National Forest timber, and increased harvest on private lands. The average selling price on the Forest from 1977 to 1985 was $192/MBF. However, the value of the timber actually harvested over the same period was only $135/MBF. The private harvest level in the Eugene Timbershed went from 350 MMBF in 1980 to 500 MMBF in 1983, after declining steadily from 630 MMBF in 1972 (Oregon Department of Forestry). For the last three years (87,88 and 89) the volume harvested has exceeded the volume sold, but the planning period average remains about 17% less than the allowable harvest level.

The potential yield for the Preferred Alternative is also the ASQ. The potential yield for the Current Plan (810 MMBF) was never offered for sale. A major concern of some of the public is that we will

continue to offer significantly less than the potential yield. However, the Forest expects to sell 100% of the potential yield of the Preferred Alternative over the planning decade for the following reasons: (1) more accurate delineation of suitable timber land; (2) more realistic assumptions regarding silvicultural intensities; (3) more accurate calculations of harvest reductions to meet other resource goals; and (4) with more accurate planning, full funding is expected. When planning assumptions are correct, targets should be obtainable within the standards and guidelines. However, ASQ and annual targets are secondary to standards which will not be violated to achieve annual targets (Regional Forester, 2430/1920 Letter, March 22, 1990).

Managed Yield Tables - The following discussion provides more information about the difference in the managed timber yield tables between the Current Plan (Alternative NC) and the other alternatives. This difference results from the following changes in inventory techniques, yield models, management intensities, and philosophies (Knapp, 1983):

Inventory techniques -

Site tree selection - The previous inventory allowed selection of an appropriate tree outside of the plot area. The present inventory required selection of the site tree in the plot, resulting in a more accurate measure of site quality.

Site Index Conversion - The site indices from both inventories use McArdle's Douglas-fir site index based on 100 years total age. The DFSIM model used for construction of managed yield tables uses King's site index based on 50 years at breast height age. Conversion to King's site index is a source of minor difference.

Land Stratification - Under the Current Plan the Forest was stratified into working groups (based on species, age and site class) after the inventory. The new plan stratified the Forest before the inventory (by species and size class) and sampled each working group as necessary to achieve a sampling error of less than 10%. The effect of the different methods on Forest-wide ASQ is not known, but working group level yields are more accurate with the new inventory.

Table II-7. Comparison--Past, Present, and Alternatives Timber Outputs (MMBF)

Output	Existing TM Plan	1977-89 Annual Average Timber Sold/Cut	Alternatives						
			NC [1]	K	A	J	W	D	L
I. ALLOWABLE SALE QUANTITY (ASQ) -- The allowable sale quantity is composed of those volumes resulting from the yield projections of FORPLAN. ASQ is obtained from lands designated as suitable for timber production under NFMA standards, and meets the utilization standards in the Regional Guide. When sold, the volume is called "chargeable," and is used to determine achievement of planned allowable sale quality goals.									
Potential Yield [1]									
Green	797	623/538	797	634	594	517	479	465	147
Salvage	53		13	16	14	13	12	11	3
TOTAL Allowable Sale Quantity	850	623/538	810	650	608	530	491	476	150
II. OTHER SAWTIMBER -- Meets utilization standards in Regional Guide, but is not considered "chargeable" against the planned allowable sale quantity goals.									
A. Sawtimber from lands designated unsuitable for timber production--this volume is estimated based on the incidental volume of timber that will be sold from lands that are not designated for timber production.									
Green		2/2	2	2	2	2	1	1	1
Salvage									
TOTAL Sawtimber Volume From Unsuitable Lands		2/2	2	2	2	2	1	1	1
B. Dead sawtimber from lands that are designated suitable for timber production, but which was not included in yield tables.									
		24/20	29	22	21	18	17	16	5
TOTAL -- Other Sawtimber		26/22	31	24	23	20	18	17	6
III. SUBMERCHANTABLE VOLUMES FROM ALL LANDS -- The estimated timber volume that does not meet the utilization standards in the Regional Guide, but which could be utilized for products other than sawtimber. It is not considered "chargeable" against planned allowable sale quantity goals.									
Fuelwood		30/25	39	28	27	23	22	21	7
Other (including cull)		100/87	133	97	90	79	73	71	22
TOTAL Submerchantable Volume		130/112	172	125	117	102	95	92	29
TOTAL NET MERCHANTABLE SAWTIMBER (I + II)		649/560	841	674	631	550	509	493	156
TOTAL NONCHARGEABLE (II + III)		156/134	203	149	140	122	113	109	35
TIMBER SALE PROGRAM QUANTITY (I + II + III) -- The timber sale program quantity includes the allowable sale quantity for the 1st decade and estimated additional volume planned for sale during the 1st decade, such as fuelwood.									
		779/672	1013	799	748	652	604	585	185

[1]The assumptions that were used in the existing timber management plan to calculate potential yield differ from those that were used to calculate Allowable Sale Quantity. While potential yield represented a level that could be produced, allowable sale quantity represents a timber objective and program for achievement of planned levels. However, both the potential yield and allowable sale quantity do represent a ceiling on the amount of chargeable timber volume that could be sold for a given decade. In this context, the two terms are comparable.

Table II-8. Volume Comparison of Alternative NC, A, and W

Description	Potential Yield MMBF	Comments
Alternative NC (No Change)	897	Landbase = 1,125,500 acres (current Plan-1977 without NFMA Requirements)
Adjustments:		
Landbase	-10	French Pete Additions (1980) 15,000 acre reduction of suited land
	-37	Oregon Wilderness Act (1984) 45,880 acre reduction of suited land
Salvage	-40	Removes salvage volume
Alternative NC (No Change)(1984)	810	Potential yield. Includes only net green and salvable dead. Landbase = 1,064,620 acres.
Alternative A (No Action) (current Plan with NFMA Requirements)		
Adjustments:		
Landbase	-145	190,330 acre reduction for nonforest, unsuited and MRs
Forest productivity	-57	Reduction due to differences in yield tables and management intensities.
Alternative A (No Action)	608	Potential yield. 25% decrease represents the Current Plan land allocations implemented under NFMA. Landbase = 874,290 acres.
Alternative W (Preferred) (Proposed Forest Plan with NFMA Requirements)		
Adjustments:		
Landbase	-69	99,690 acre reduction for additional no-harvest allocations to deal with current Forest issues.
Forest productivity	-48	Additional drop from No Action Alternative due to more restrictive harvest rate constraints to meet resource objectives. This results in a 9% decrease in productivity.
Alternative W	491	Potential yield. This is a 19% change from the Current Plan under NFMA, (No Action). Landbase = 774,600 acres.

Managed Timber Yield Models - The Current Plan used the Managed Yield (MGYLD) computer program to make yield calculations. The new plan uses two models, DFSIM for low elevation timber types and Prognosis for high elevation types. Further discussion of timber yield models and yield table development can be found in Appendix B, Section C.5., and in the planning records. The major differences are summarized in Table II-9.

Table II-9. Comparison of Managed Timber Yield Models

	MGYLD	DFSIM, Prognosis
Height growth:	Increase of six Site Index points for stocking level control (PCT).	Both use height function for stocking level control.
Height curve:	Used McArdle's SI curves.	DFSIM uses Bruce's height curve which is generally lower than McArdle's in first half of rotation. Prognosis uses local height curve.
Average tree:	Assumed site index tree represented the stand average tree.	DFSIM uses a stand volume function and assumes the average tree is the tree of mean volume. For Prognosis, the average tree is less than the site index tree.
Model influences:	Volume is highly sensitive to timing and number of thinnings.	Volume is relatively insensitive to timing of thinnings, number of thinnings and initial stocking levels.

Management Intensity -

Precommercial Thinning (PCT) - The Current Plan assumed a 49% increase in yield for PCT. The new yield tables show an increase of 21% for PCT.

Commercial Thinning (CT) - The Current Plan allowed thinning on a 10 year cycle beginning at age 34 (9-inch d.b.h.), with up to six entries. As much as 41% of the suited landbase was scheduled for CT in a single decade.

In the Proposed Forest Plan, CT is constrained to a 20 year cycle beginning at age 47 (12-inch d.b.h.), with a maximum of two entries. The result is a maximum of 28% of the suited landbase scheduled for CT in any decade. These constraints are based on resource, economic and operational considerations that take into account impacts on other resources, reasonable expectations of work force, and funding situations.

Genetics - The Current Plan does not include an increase in yields for planting genetically superior stock. The new tables use a 10% increase for all working groups.

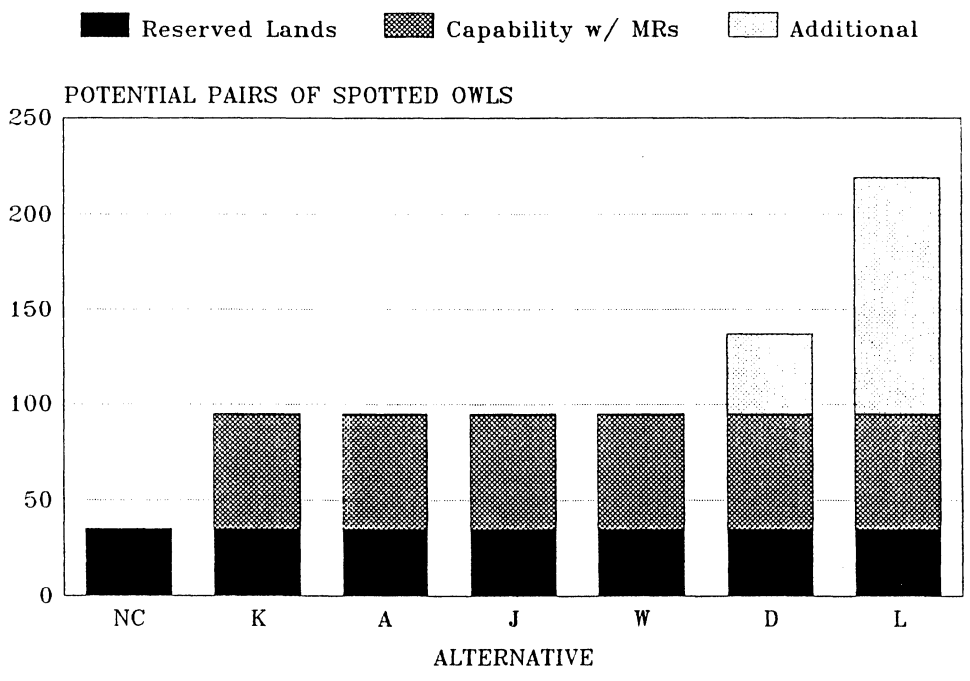
Fertilization - The Current Plan assumed fertilizer would not be available for use. The Proposed Forest Plan assumes fertilizer will be applied once (at the rate of 200 pounds of nitrogen/acre) to acres which are stocked with at least 60% Douglas fir. This represents about 80% of the suited landbase. Fertilizer increases yields by an average of 7% at culmination of mean annual increment.

Management Philosophy - During the development of the Current Plan, the emphasis was on what *could* we produce with a given level of management. In the Proposed Forest plan the question is what does the Forest anticipate *will* be grown in response to a certain level of management? The first perspective is on the *potential*, the second is on the *expected*.

Wildlife

Spotted Owl Habitat - The Management Requirement (MR) network of spotted owl habitat areas (SOHAs) will be maintained in all of the Forest Plan Alternatives except for the No Change Alternative. Alternatives D and L provide habitat capability above the MR level. All alternatives provide an equal amount of habitat capability for reserved lands. All land designated for protection of spotted owl habitat will be considered unsuited for timber production. Figure II-4 illustrates the habitat capability to support pairs of northern spotted owls provided in each alternative.

Figure II-4. Spotted Owl Habitat Capability

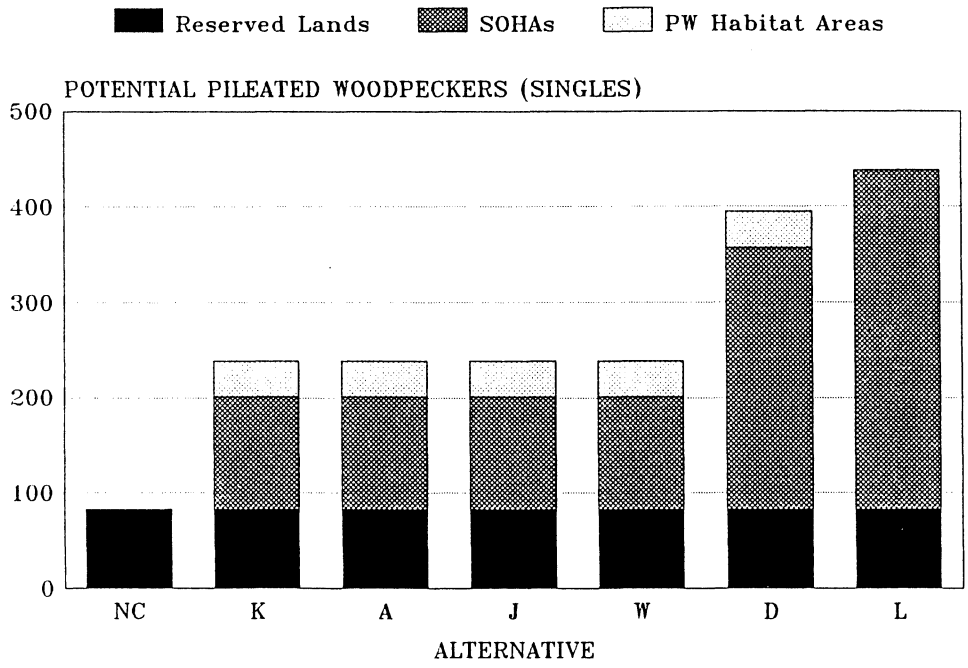


	Alternatives						
Pair Capability	**NC**	**K**	**J**	**A**	**W**	**D**	**L**
SOHA Level[1]	NA[2]	60	60	60	60	60	60
Additional Provided [3]	0	0	0	0	0	42	124
Capability in Reserved Lands[4]	35	35	35	35	35	35	35
TOTAL CAPABILITY IN PAIRS	35	95	95	95	95	137	219

[1]Verified pairs of spotted owls located within the MR SOHA network of 59 areas.
[2]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Section D4b, of Chapter II in the Draft EIS describes these differences.
[3]Verified pairs of spotted owls protected above MR levels; based on habitat capability in Alternative L and additional SOHA designation in Alternative D.
[4] Potential pairs of spotted owls based on capability in wilderness.

Pileated Woodpecker Habitat - Figure II-5 displays the long term habitat capability for pileated woodpeckers on the Forest by Alternative. The combination of reserved lands, spotted owl habitat areas, and pileated woodpecker habitat areas provide the quality, quantity, and distribution of habitat required to meet or exceed the Management Requirements for pileated woodpeckers in all alternatives except No Change. Habitat capability on reserved lands is the same for all alternatives.

Figure II-5. Habitat Capability for Pileated Woodpeckers[1]

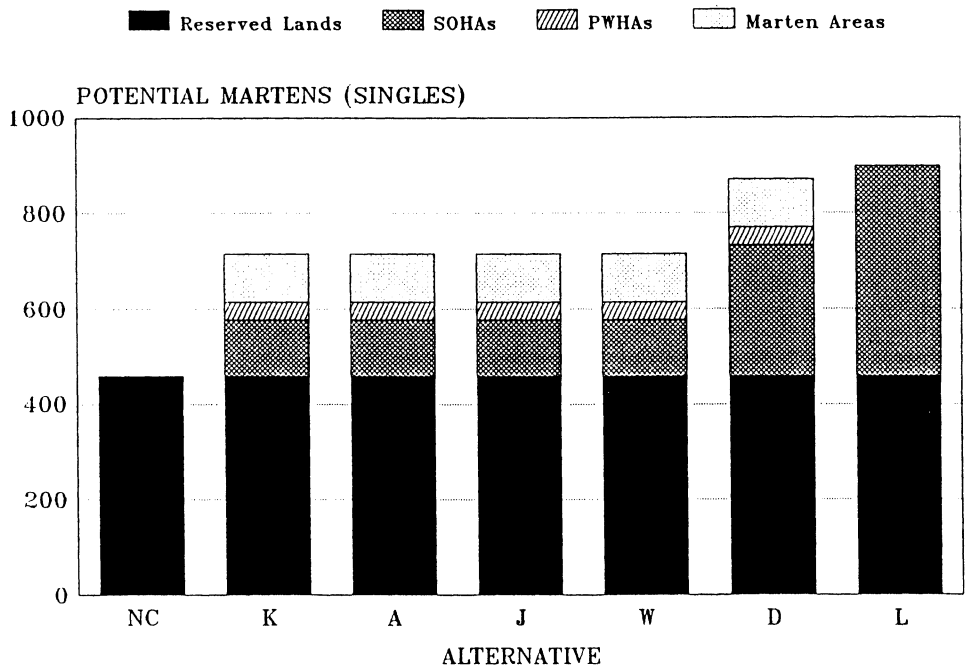


	Alternatives						
Habitat Capability	**NC**	**K**	**J**	**A**	**W**	**D**	**L**
Pileated Woodpecker Habitat Areas	NA[3]	38	38	38	38	38	--[2]
SOHAs	NA[3]	118	118	118	118	274	355
Reserved Lands	83	83	83	83	83	83	83
Total Habitat Capability	83	239	239	239	239	395	438

[1] Habitat capability is expressed as potential numbers of individual pileated woodpeckers.
[2] No specific allocation of pileated woodpecker habitat is needed to meet MR levels for habitat quality or distribution; capability is maintained by the existing condition.
[3]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Section D4b, of Chapter II in the Draft EIS describes these differences.

Marten Habitat - Marten utilize a broader range of habitat than either spotted owls or pileated woodpeckers. All vegetation series with mature and old-growth Forests are used as habitat. Marten habitat will be provided at or above Management Requirements in all the alternatives except for No Change. Because marten use similar mature and old-growth habitat as spotted owls and pileated woodpeckers, a combination of reserved lands, spotted owl habitat areas, pileated woodpecker habitat areas, and marten habitat areas will contribute to meeting Management Requirements. Habitat areas designated specifically for marten occur wherever quantity, quality, or distribution of habitat appear limited. All alternatives provide the same habitat capability within reserved lands. Figure II-6 displays the habitat capability for marten provided in each alternative.

Figure II-6. Marten Habitat Capability [1]



	Alternatives						
Habitat Capability	**NC**	**K**	**J**	**A**	**W**	**D**	**L**
Marten Habitat Areas	NA[3]	100	100	100	100	100	--
Martens in PWHAs	NA[3]	38	38	38	38	38	--
Marten in SOHAs	NA[3]	118	118	118	118	274	438
Marten in Reserved Lands	459	459	459	459	459	459	459
Total Habitat Capability	459	715	715	715	715	871	897

[1] Habitat capability for marten is expressed as potential population of individual martens.
[2] No specific allocation is needed to meet MRs for habitat quality, quantity or distribution.
[3]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Section D4b, of Chapter II in the Draft EIS describes these differences.

Bald Eagle Habitat - Five pairs of bald eagles are known to nest on the Forest. Bald Eagle Management Plans exist for two of these pairs. The areas included in the Management Plans are located near Hills Creek Reservoir and Lookout Point Reservoir. Existing Bald Eagle Management Plans must be revised and new plans prepared for all known nesting pairs during Forest Plan implementation regardless of the alternative selected. Management of all nesting pairs will comply with the Bald Eagle Recovery Plan. All alternatives consider lands within 1.1 miles of eleven major water bodies to be potential nest, roost, and forage sites for bald eagles. Table II-10 displays the Bald Eagle Recovery Plan objectives for the Forest as part of four alternatives, including the No Change Alternative. Additional sites have been designated in the remaining three alternatives.

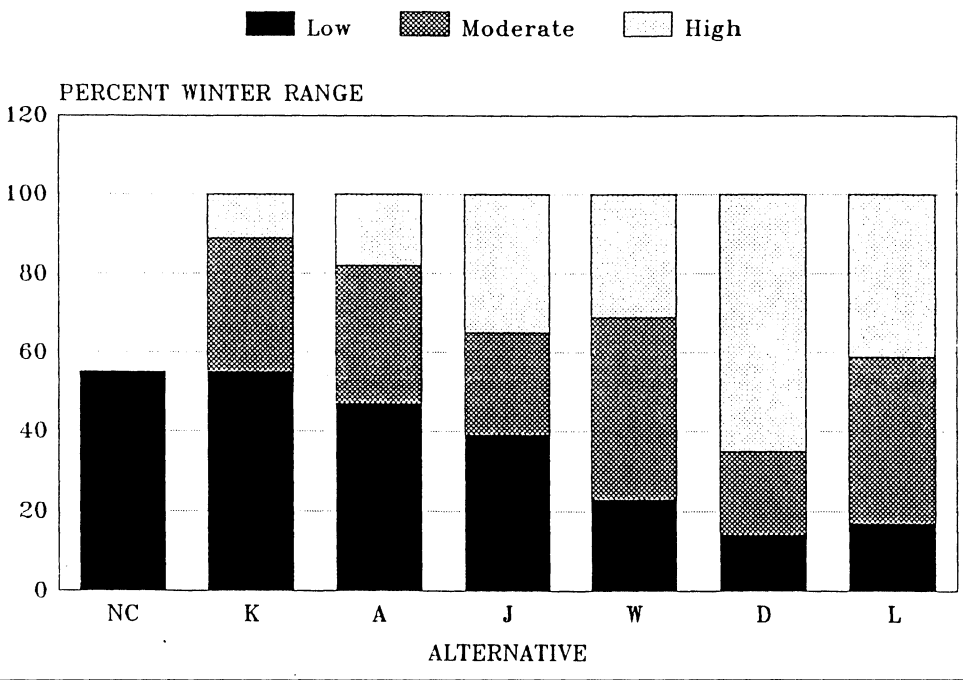
Table II-10. Bald Eagle Habitat

	Alternatives						
Acres of Habitat	**NC**	**K**	**J**	**A**	**W**	**D**	**L**
Existing BEMAs [1]	1472	1472	1472	1472	1472	1472	1472
Potential Nest Sites [2]	725	725	725	725	2250	3000	3000
TOTAL	2197	2197	2197	2197	3722	4472	4472

[1]These acres reflect nest, roost, and forage habitat designated through development of bald eagle management plans for Hills Creek and Lookout Point.
[2]Habitat identified is within 1.1 miles of major water bodies surveyed. Management plans are being developed for three known nest sites that are included in this category.

Deer and Elk - Habitat conditions on winter range are considered a limiting factor influencing survival of wintering deer and elk populations. The manaegment emphasis placed on winter range habitat effectiveness determines potential deer and elk populations. A total of 605,367 acres of winter range have been delineated on the Forest. Habitat objectives set for each level of management emphasis include summer range as well as winter range. Deer and elk populations occurring on the Forest are migratory, thus management of the entire range will be required to maintain healthy, productive populations. Figure II-7 displays the habitat effectiveness emphasis levels for winter range provided by each alternative.

Figure II-7. Optimal Cover on Deer and Elk Winter Range

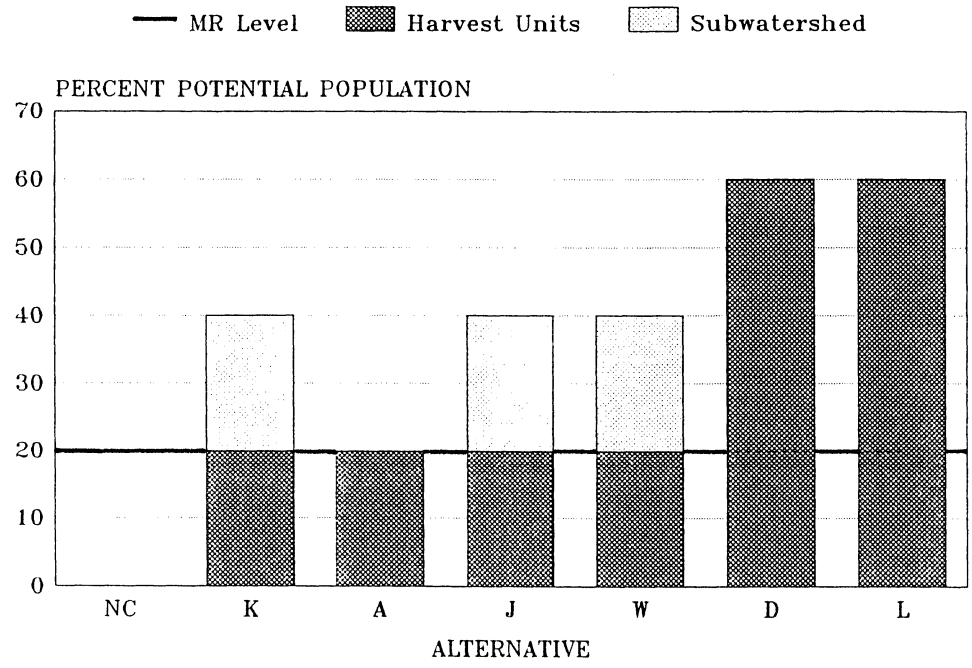


	Alternatives						
Percent Cover	**NC**	**K**	**J**	**A**	**W**	**D**	**L**
Optimal Cover	NA[1]	31	33	34	36	37	41

[1]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Section D4b, of Chapter II in the Draft EIS describes these differences.

Primary Cavity Excavators - All alternatives except No Change provide habitat capability to meet or exceed the Management Requirements for primary cavity excavators. Snag habitat would be maintained at or above levels required to support 40% potential populations within each subwatershed. Figure II-8 displays the percent potential populations managed for in subwatersheds and harvest units by alternative.

Figure II-8. Primary Cavity Excavator Habitat Capability[1]



	Alternatives						
% Habitat Capability	**NC**	**K**	**J**	**A**	**W**	**D**	**L**
Within Harvest Units	NA[2]	20	20	20	20	60	60
Within Subwatersheds	NA[2]	40	20	40	40	60	60
Reserved Lands	100	100	100	100	100	100	100

[1]Habitat capability is calculated for pairs of birds and is based on the needs of the red-breasted nuthatch, which has the smallest territory on the Forest.

[2]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Section D4b, of Chapter II in the Draft EIS describes these differences.

Old Growth

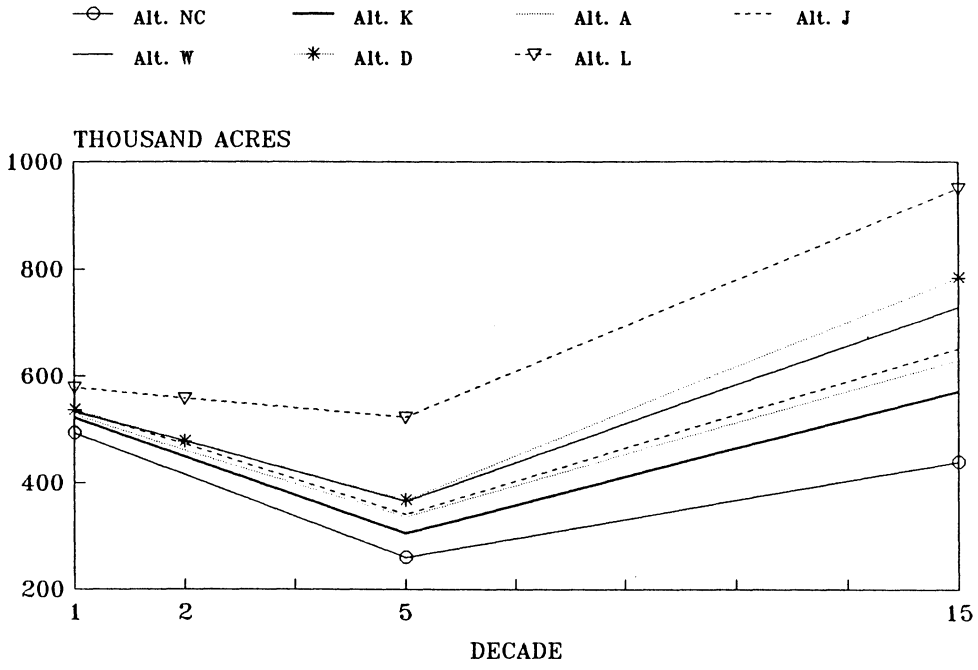
Old-growth timber is characterized by large old trees, multi-layered canopies, standing snags, and large logs in streams and on the forest floor. In the Douglas-fir region of western Oregon, old-growth forests begin to develop at between 150 and 250 years of age (Spies, 1989). Managed stands may begin to show these characteristics earlier by leaving large standing green trees and snags, and large woody debris on the ground. These stands may provide some of the needs for wildlife and plant species that are associated with old growth as early as 60 to 70 years after regeneration of the site following harvest activities. Existing young stands that are to be managed on long rotations can be commercially thinned to wider spacings in order to stimulate the development of multi-canopy stands. Alternatives J, W, D and L manage long rotation areas by leaving 10 large green trees, in addition to wildlife trees, to enhance the development of old growth habitat. All of the alternatives have the option of thinning existing young stands to a wider spacing to enhance understory development in areas of long rotations.

Fragmentation of old growth stands reduces the quality of the habitat for several reasons: 1) the edges of old growth stands are poorer quality due to increased disturbance and climatic extremes; 2) small stands are not suitable for species who require larger home ranges; and 3) animals and plants moving between widely spaced old growth habitat are subjected to higher rates of mortality. Long-term viability of populations of some species may be lower in landscapes where their habitat is highly fragmented. Minimizing fragmentation by grouping harvest units closer together is an option for maintaining the remaining large blocks of old growth habitat for a longer period of time. This option is available under all alternatives, where compatible with other resource objectives.

Because of the current concerns about global warming and increasing levels of carbon dioxide in the atmosphere, it is appropriate to discuss the role of forests in cycling and storing carbon. Carbon dioxide is one of the radiatively active gases that may be involved in the "greenhouse effect". Forests account for about 60% of the stored carbon on the earth's land surface, and old growth forests store significantly more than managed forests, even when considering repeated rotations (Harmon, et. al., 1990). The net reduction in stored carbon when converting from old growth to managed stands is about 150 tons per acre. The effects of the alternatives do not differ much and are not significant by themselves, when comparing against the regional levels of carbon storage. Long-term monitoring and research is needed to determine cumulative effects.

As a result of the Mature and Overmature Survey (MOMS), there are currently about 594,800 acres of old-growth stands that meet the Region Six definition of old growth (see Vegetation, Chapter III). Figure II-9 displays the amount of old-growth timber remaining at the end of decades 1, 2, 5, and 15+, for each alternative. For each alternative the lowest amount provided over time occurs in the fifth decade. Declines in old growth acres from decade 1 to 5 reflect the rate of timber harvest. Increases in old-growth stands after the fifth decade represent timber stands in no-harvest allocations, currently in a young or mature condition, that in the future will begin to exhibit old-growth characteristics. The figure for decade 15+ represents the potential amount of old growth for each alternative, barring catastrophic events.

Figure II-9. Old-Growth Acres Over Time



	Alternatives [1]						
	NC [2]	K	A	J	W	D	L
Decade 1 (M Ac.)	494.0	522.4	528.4	534.9	533.4	537.2	578.3
Decade 2 (M Ac.)	NA	449.7	460.9	473.6	479.1	478.4	558.1
Decade 5 (M Ac.)	259.8	305.1	337.0	341.4	365.2	367.8	523.1
Decade 15+ (M Ac)	440.1	571.7	630.2	651.1	729.9	785.1	951.4

[1]Acres of old-growth timber, in all allocations, remaining at the end of each decade. Decade 15+ values show potential old growth on forested no-harvest allocations, assuming no catastrophic events.

[2]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Forest FORPLAN model. Differences are described in Chapter II, Description of Alternatives.

Fish

Anadromous and resident salmonids are Management Indicator Species for stream habitat. The estimated number of anadromous smolt is dependent on the number of returning adults, and the quantity and quality of habitat.

The numbers of spawning adults will be influenced by stocking programs and fishing regulations established by Oregon Department of Fish and Wildlife (ODFW). The Forest will aid in enhancement of population levels through management of smolt incubator boxes. These, and other improvement projects are conducted in cooperation with the volunteer program, Salmon and Trout Enhancement Program (STEP).

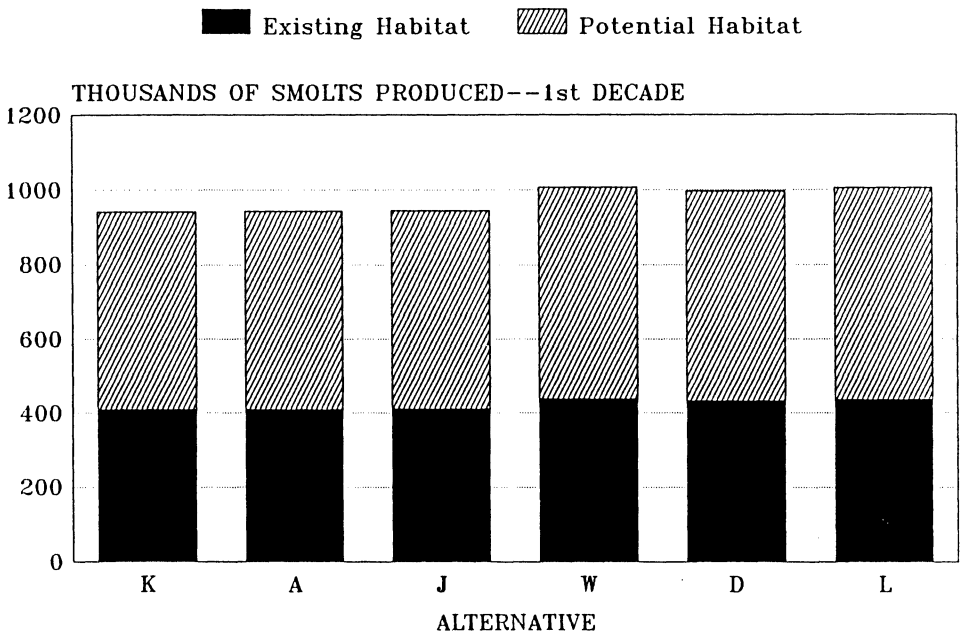
Changes to the quality of existing habitat during the next decade is influenced by habitat improvement projects, and the effects of timber sale projects. Approximately 60 miles of existing anadromous habitat, will be scheduled for habitat improvement projects in all alternatives. Increases in smolt from these projects will not become apparent for 3 generations of returning adults, thus will not be seen until the second decade.

Changes to the quantity of habitat available during the next decade will be largely dependent on the success in providing passage for spring chinook around four major reservoirs; Green Peter, Foster, Blue River, and Cougar. Minor increases in the quantity of habitat may be acheived around smaller barriers to passage on the Forest. The Forest Service will work in partnership with ODFW, Army Corps of Engineers (ACE) and other agencies to facilitate passage around these reservoirs. Habitat improvement projects would be made in approximately 30 miles of this additional habitat.

Timber sales effect the capability of streams to produce smolt in approximately the same proportion of acres harvested, with particular influence from practices which effect riparian areas, and slope stability.

Estimates of outputs are shown as Smolt Habitat Capability Index in the Figure II-10. This is intended to show relative differences between alternatives and other practices influencing smolt production.

Figure II-10. Smolt Habitat Capability Index



	Alternatives						
Smolt Produced [2]	**NC [1]**	**K**	**A**	**J**	**W**	**D**	**L**
FIRST DECADE							
Existing Habitat	NA	409	410	411	438	433	438
Potential Habitat	NA	533	533	535	569	564	569
TOTAL		942	943	946	1007	997	1007
SECOND DECADE							
Existing Habitat	NA	536	536	538	572	567	572
Potential Habitat	NA	744	744	746	794	786	794
TOTAL		1280	1280	1284	1366	1353	1366

[1]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Differences are described in Alternatives Considered in Detail, Chapter II.

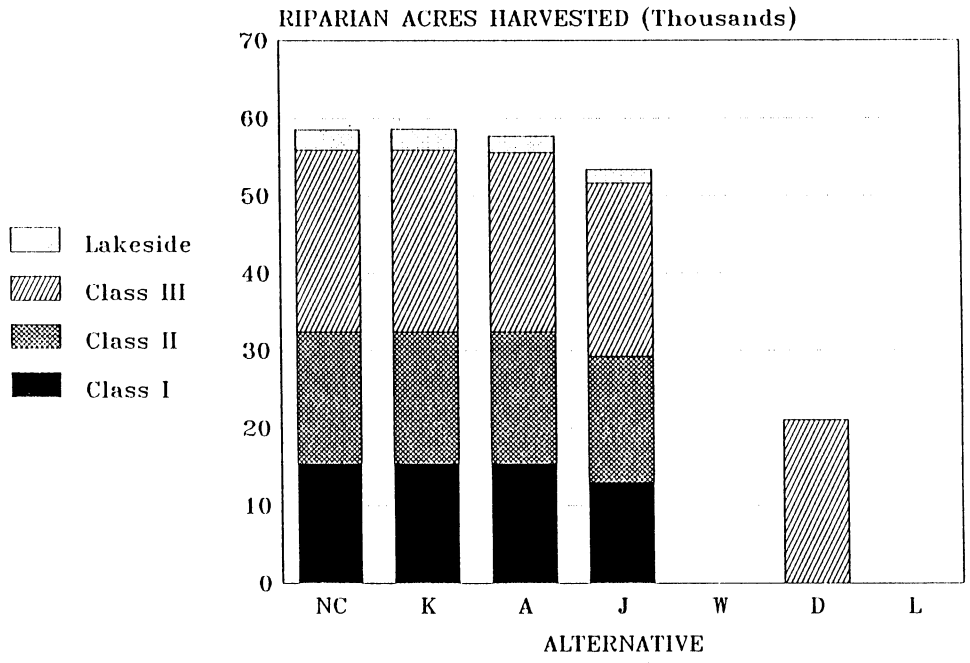
[2]Calculated with coefficients described in "Anadromous Fish Planning Coefficients" 1920 Memo, May 1, 1987. Index numbers indicate thousands of smolt.

Riparian

Timber harvest is scheduled from riparian areas in Alternatives NC, A, K, and J. In these alternatives harvest is scheduled at 5% per decade for Class I and II streams, and 7% per decade for Class III streams. Alternative D proposes no harvest on Class I, and II streams, and 5% per decade on Class III streams. Alternative W and L propose scheduling no timber harvest from areas adjacent to any of these perennial streams. Figure II-11 displays riparian acres by stream class which are scheduled for some level of timber harvest in each alternative. Where the estimated rate of harvest is lower than the rates described above, the acres are in allocations with reduced harvest rates.

Harvest rates within the riparian areas have effects on many resources. Riparian dependent resources, such as water, fish, terrestrial and amphibian species will be influenced. Management of vegetation in riparian zones has the potential to effect the availability of optimal thermal cover for big game animals, and habitat for birds which are primary cavity excavators. These areas have the potential to provide important corridors for dispersion of interior species across the landscape, and to provide quality recreation opportunities for visitors to the Forest.

Figure II-11. Comparison of Riparian Area Management



		Alternatives[1]						
Stream Class	**% Harvest Rate/ Decade**	**NC[2]**	**K**	**A**	**J**	**W**	**D**	**L**
Class I	0%	NA	4.1	4.1	6.5	19.5	19.5	19.5
	5%	NA	15.4	15.4	13.0	0	0	0
Class II	0%	NA	4.5	4.5	5.2	21.5	21.5	21.5
	5%	NA	17.0	17.0	16.3	0	0	0
Class III	0%	NA	6.1	6.5	7.3	29.7	8.6	29.7
	5%	NA	0.4	0.5	0.6	0	21.1	0
	7%	NA	23.2	22.7	21.8	0	0	0
Lakeside	0%	NA	2.0	2.2	2.6	4.5	4.5	4.5
	5%	NA	0.8	0.9	1.1	0	0	0
	7%	NA	1.2	1.0	0.4	0	0	0
	10%	NA	0.6	0.4	0.4	0	0	0

[1]Total riparian acres in management areas with scheduled harvest in thousands of acres.
[2]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Forest FORPLAN model. Differences are described in Chapter II, Description of Alternatives.

Roadless Lands

Roadless lands are defined as inventoried areas of undeveloped Federal land within which there are no improved roads maintained for travel by motorized vehicles intended for highway use. The roadless area inventory does not include areas designated by Congress (Wilderness, the Oregon Cascades Recreation Area which comprise 23% of the Forest), or other areas of less than 5,000 acres.

In the Forest, current roadless lands in parcels larger than 5,000 acres or adjacent to Wilderness, comprise 172,007 acres in 31 inventoried areas. The alternatives vary in the amount of roadless land they maintain in an undeveloped condition. Each alternative proposes management of these lands for uses that range between full commodity production and recommended Wilderness. Table II-11 displays the percent of each roadless area to remain in an undeveloped condition in each alternative.

Table II-11. Percent of Roadless Land Retained in an Undeveloped Condition

	Alternatives							
Roadless Area	Acres	NC	K	A	J	W	D	L
Bull of the Woods	6,375	65	76	75	95	94	94	56
Opal Creek	10,687	3	10	11	10	16	44	78
Elkhorn	8,958	0	15	15	15	20	99	39
Mt. Jefferson North	6,036	1	15	11	15	18	75	78
Mt. Jefferson South	4,991	1	36	28	33	34	80	98
Middle Santiam	6,783	0	3	3	3	7	59	91
Echo Mountain	7,551	68	7	70	84	81	98	99
Moose Lake	4,778	0	25	25	25	28	27	69
Menagerie (Rooster Rock)	405	0	0	0	0	5	0	16
Gordon Meadows	8,361	0	5	2	32	44	96	94
Mt. Washington North	1,003	2	15	2	21	21	100	96
Mt. Washington West	6,676	1	2	3	12	15	97	49
Mt. Washington South	4,224	3	6	3	89	90	100	100
Huckleberry	853	100	93	100	100	100	100	100
Frog Camp	469	100	0	0	100	100	100	100
Gold Creek	1,045	2	16	16	29	33	78	98
Rainbow Falls	43	0	0	0	0	0	0	0
Mosquito Creek	406	5	0	5	0	11	0	74
French Pete [1]	2,581	1	9	13	72	79	98	36
Roaring River	2,048	0	0	0	10	9	9	82
Mt. Hagan	6,292	12	21	33	39	42	99	75
McLennen Mountain	7,807	8	21	21	21	23	49	83
Chucksney Mountain	15,507	59	9	66	68	70	83	89
Waldo Lake [1]	31,889	31	6	35	50	72	88	96
Cornpatch	6,762	0	22	22	22	46	26	90
Charlton Butte	2,880	100	41	100	100	100	100	100
Maiden Peak	11,070	100	8	100	100	100	100	100
Hardesty Mountain	3,690	1	27	27	66	71	83	99
Bulldog Rock	555	50	27	50	100	100	100	100
Diamond Peak North	1,130	2	19	17	40	58	81	96
Diamond Peak South	149	0	0	0	0	100	100	71
Total All Areas-Acres and %	172,007	26	15	35	46	53	80	85

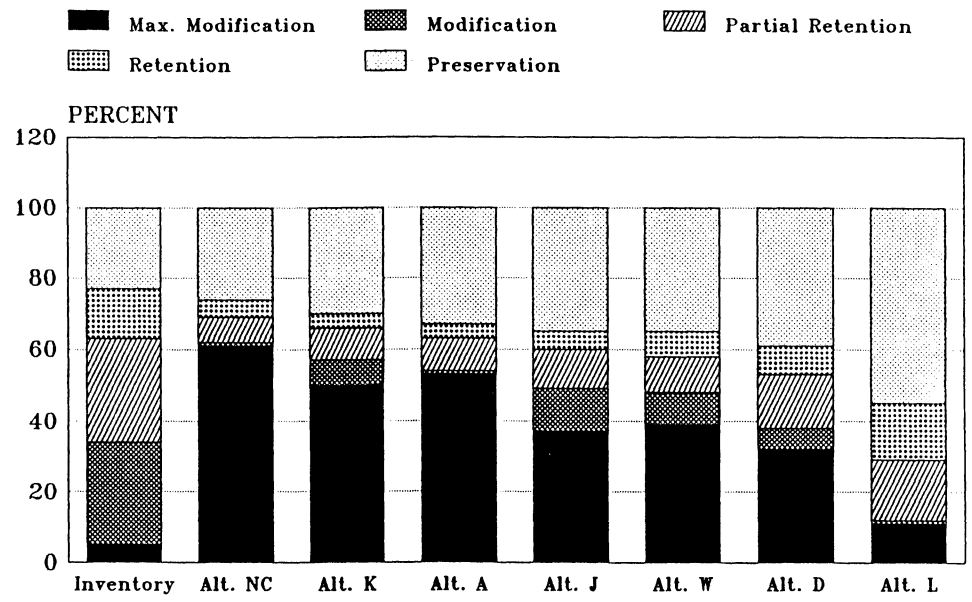
[1]This area is divided into several parts for purposes of description in Appendix C.

Scenery

The alternatives have varying effects on scenic quality as a result of the type and distribution of the proposed management areas and their associated activities. In general, alternatives emphasizing timber harvest and supporting road construction provide less Forest area managed for high levels of scenic quality.

Figure II-12 provides a Forest-wide comparison of alternatives and their effect on scenery as measured against inventoried Visual Quality Objectives (VQOs). There will be an increase in the amount of area managed for preservation as a consequence of implementing any of the proposed alternatives. However, lands to be managed for retention, partial retention, and modification VQOs will decrease from inventory levels in all alternatives, except in Alternative L where management of lands for retention will exceed inventory levels by 2%.

Table II-12. Forest-wide Effects on Inventoried Visual Quality Objectives



Visual Resource Inventory			Alternatives [1]						
Objectives	Acres	Percent	NC	K	A	J	W	D	L
Preservation	389,486	23	26	30	33	35	35	39	55
Retention	232,262	14	5	4	4	5	7	8	16
Partial Retention	488,649	29	7	9	9	11	10	15	17
Modification	484,170	29	1	7	1	12	9	6	1
Maximum Modification	80,841	5	61	50	53	37	39	32	11
TOTAL	1,675,408	100	100	100	100	100	100	100	100

[1]Expressed as percent of Inventoried Visual Quality Objective acres.

Recreation

The design of each Alternative, through the use of management areas, determines the number and type of recreational settings to be provided as well as the magnitude and nature of its recreation program. Each Alternative establishes the availability and distribution of recreation settings, miles of trail, and use levels of both developed and dispersed recreation opportunities, and thus determines the capability of the Forest to meet present and future demand for a wide range of recreation experiences. The capacity of recreational settings to sustain projected levels of demand is measured in capacity and anticipated demand for each Alternative, and Table II-12 shows the amount of each recreation opportunity setting to be provided by Alternative.

Figure II-13. Total Dispersed Recreation Use

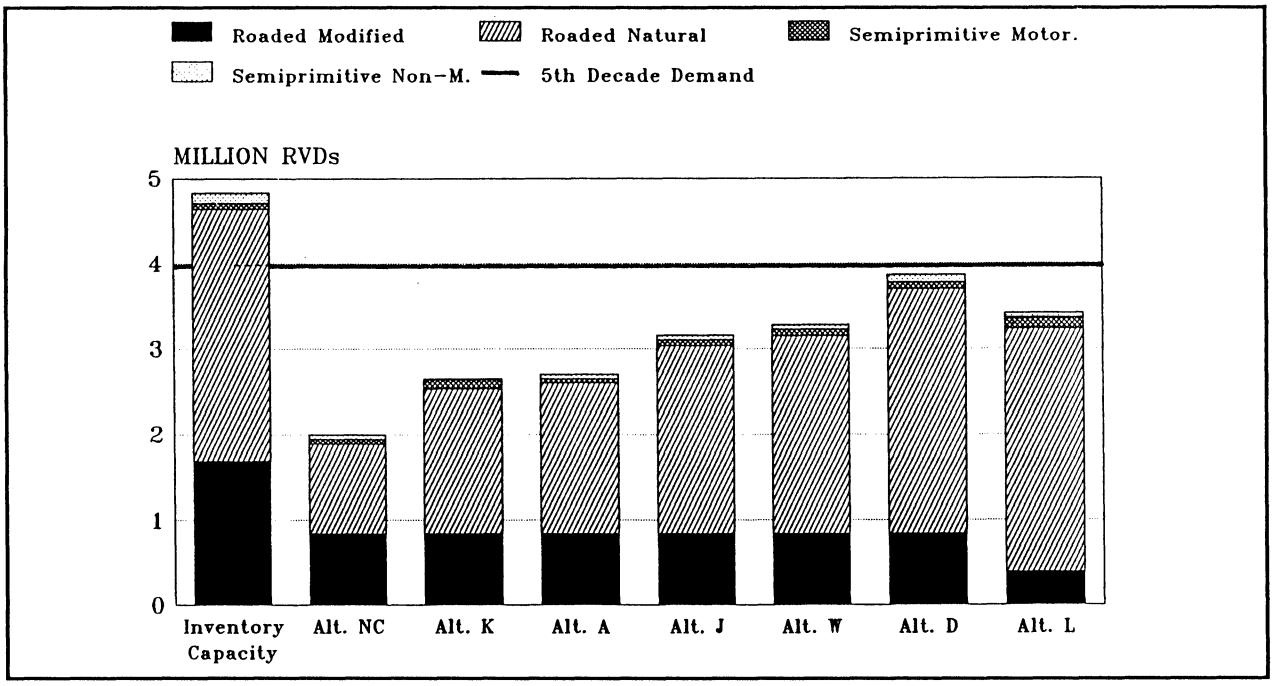


Table II-12 Recreation Opportunity Settings Provided

		Alternatives						
Opportunity Setting	**Unit**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Dispersed Recreation	M Acres							
Semiprimitive Nonmotorized		75.3	14.4	72.2	89.5	85.8	176.5	102.0
Semiprimitive Motorized		23.9	48.3	23.4	31.3	36.0	38.2	66.3
Roaded Natural		160.8	279.7	299.1	353.0	379.0	439.9	739.6
Roaded Modified		1,034.7	952.2	900.0	820.8	793.8	637.0	215.1
Developed Recreation Sites	Sites							
Existing Retained		204	204	204	204	204	204	204
Proposed New		0	54	0	15	31	18	0
NonWilderness Trails	Miles							
Existing Retained		714	714	714	714	714	714	714
Proposed New		0	0	0	40	60	68	40

Wild and Scenic Rivers

All of the alternatives provide for protection and management of free-flowing conditions and "outstandingly remarkable values" of designated Wild and Scenic Rivers and designated Study Rivers in accord with the Wild and Scenic Rivers Act. Also, all of the alternatives, except the No Change Alternative, provide interim protection for all rivers determined eligible for inclusion into the National Wild and Scenic Rivers System. Interim protection of free-flowing conditions and "outstandingly remarkable values" of designated Study Rivers and all eligible river segments is provided at the highest river classification for which they qualify. Interim protection of both designated Study Rivers and eligible river segments is maintained until a river segment is determined unsuitable for inclusion into the National System. The management status, river mileage, and corridor acreage of Forest rivers for each alternative is displayed in Table II-13.

Table II-13. Wild and Scenic River Protection Status

		Alternatives						
River Designation[1]	**Units**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Wild and Scenic Rivers	Rivers	2	2	2	2	2	2	2
	Miles	55.0	55.0	55.0	55.0	55.0	55.0	55.0
	Acres	17,459	17,459	17,459	17,459	17,459	17,459	17,459
W & S Study Rivers	Rivers	2	2	2	2	2	2	2
	Miles	34.2	34.2	34.2	34.2	34.2	34.2	34.2
	Acres	10,944	10,944	10,944	10,944	10,944	10,944	10,944
Eligible for W & S Status	Rivers	0	8	8	8	8	8	8
	Miles	0	122.2	122.2	122.2	122.2	122.2	122.2
	Acres	0	41,927	41,927	41,927	41,927	41,927	41,927
TOTALS	Rivers	4	12	12	12	12	12	12
	Miles	89.2	211.4	211.4	211.4	211.4	211.4	211.4
	Acres	28,403	70,330	70,330	70,330	70,330	70,330	70,330

[1] The Little North Santiam River, McKenzie River, South Fork of the McKenzie River, and the North Fork of the Middle Fork of the Willamette River are also designated as State Scenic Waterways.

Wilderness

The Wilderness Act of 1964 states that Wilderness is to be managed in such a manner "devoted to the public purpose of recreational, scenic, scientific, educational, conservation and historical use" only to the extent that the essential Wilderness character of the area is protected. However the accommodation of any use of Wilderness is likely to result in some effect on it's resources or character. A Wilderness management system known as the Wilderness Resource Spectrum (WRS) is the primary method used to assure objectives of the Wilderness Act are realized. The WRS is divided into four management classes that are applied to areas within Wilderness based on such factors as use density, resource conditions, user experiences, and location of camping sites and trails. The alternatives vary widely in how they propose to accommodate human use and protect essential Wilderness character as required by the Act. Each alternative responds differently to this requirement, primarily, through the amount and distribution of WRS Classes and application of their respective standards and guidelines for management of human use and resource conditions. The amount of each WRS Class and projected visitor use, by class, for each alternative is displayed in Table II-14.

Table II-14. Wilderness Resource Spectrum Acres and Visitor Days

		Alternatives 1						
WRS Class	**Units**	**NC[2]**	**K**	**A**	**J**	**W**	**D**	**L**
Pristine	Acres	--	299.3	299.3	299.3	299.7	299.3	411.2
	RVDs	--	16.7	16.7	16.7	16.7	16.7	16.7
Primitive	Acres	--	41.0	41.0	41.4	44.0	67.0	54.9
	RVDs	--	131.0	131.0	131.0	123.4	131.0	131.0
Semiprimitive	Acres	--	26.0	26.0	36.8	35.0	14.5	81.8
	RVDs	--	138.4	138.4	195.7	155.9	59.5	199.8
Transition	Acres	--	14.5	14.5	3.3	2.1	0.0	2.3
	RVDs	--	66.0	66.0	24.6	22.1	0.0	23.0
TOTALS	Acres	380.8	380.8	380.8	380.8	380.8	380.8	550.2
	RVDs	330.7	352.1	352.1	368.0	318.1	207.2	370.5

[1] Recreation Visitor Days are 1st decade outputs only.
[2] Wilderness Resource Spectrum Classes are not applicable to the No Change Alternative.

Special Areas

The Forest includes many areas that exhibit unique ecological, biological and geological characteristics as well as other areas that offer opportunities for a wide range of recreation activities within a semiprimitive setting. These lands are inventoried to identify their recreational, scientific, scenic, geological, botanic, historical, and cultural values and where appropriate are designated to protect their special features and qualities and to foster public use, enjoyment and study. The alternatives vary in the type and number of areas they propose to protect and maintain in an essentially undeveloped condition as well as in the amount of area they dedicate to these special areas. Areas inventoried as having potential or value as Special Interest Areas, Old Growth Groves, or Semiprimitive Recreation Areas but are not specifically designated as such are allocated to other uses that could, depending on the alternative, alter their suitability for special designation. The number and acreage of Special Interest Areas, Old Growth Groves, and Semiprimitive Dispersed Recreation Areas that are included in each alternative are displayed in Table II-15.

Table II-15. Special Recreation Areas

		Alternatives						
Type of Area	**Units[1]**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Special Interest Areas	Areas	4	9	4	27	46	29	7
	M Acres	1.1	2.8	1.1	22.6	31.1	15.2	3.4
Old Growth Groves	Areas	22	7	22	18	34	18	24
	M Acres	2.8	0.9	2.8	5.0	6.7	3.1	3.1
Semiprimitive Rec. Areas [2]	Areas	18	11	18	20	24	40	22
	M Acres	94.9	52.9	94.9	104.5	104	110.0	166.1
TOTALS	Areas	44	27	44	65	101	87	53
	M Acres	98.8	56.6	98.8	132.1	143.2	128.3	172.6

[1] Acreages are in thousands of acres. Variation in acres from those reported inManagement Area Acreage of Alternatves are due to overlap with Special Habitat Management Areas.
[2] Includes the Oregon Cascades Recreation Area (6,058 ac.).

Research Natural Areas

The alternatives vary in their response to research needs through the designation of new Research Natural Areas. In some of the alternatives potential research opportunities would be foregone through development of some areas for resource utilization, and some areas would be subject to the influences and potential effects of adjacent management activities. The effects on potential RNAs allocated to uses other than research is based on whether or not the selected allocation or use would result in development of area resources or that specific uses would affect baseline conditions of an otherwise undisturbed environment. The degree of development effects on RNAs in each alternative is displayed by development category in Table II-16.

Table II-16. Effects on Research Natural Areas[1]

	Alternatives[2]						
Development Categories	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
No Development	79	69	79	94	100	96	94
Limited Development	7	1	7	2	0	0	1
Full Development	14	30	14	4	0	4	5
TOTAL	100	100	100	100	100	100	100

[1]Includes Middle Santiam RNA within the Middle Santiam Wilderness, the western portion of the Torrey-Charlton RNA within Waldo Lake Wilderness, and a portion of the McKenzie Pass RNA within the Three Sisters Wilderness.
[2]Values are in percent of total acres of potential and established RNAs.

Soil and Water

The potential effects of the proposed activities on soil are highest in those alternatives with the highest timber harvest and road construction levels.

Proposed activities are expected to maintain soil conditions so that less than 20% of an area is not in detrimental soil conditions, such as compacted, displaced or eroded. Soil rehabiliation projects will be implemented where needed to reduce compaction, and establish soil cover.

The risk of loss of soil productivity due to erosion or displacement of the soil profile will be highest where trees are yarded with ground-based equipment, and where fuel treatments include broadcast burning. The extent to which these practices occur is determined during project design. The potential acres to be broadcast burned varies by alternative, but is directly related to acres clearcut. The effects of each burn are largely dependent on the climatic conditions at the time of burn. The potential production of sediment is closely correlated to the acres of regeneration timber harvest. Table II-17 displays these acres by Alternative.

Table II-17. Primary Activities Affecting Soils

Activity	Units	NC [1]	K	A	J	W	D	L
Road Construction	Miles							
	Decade 1	NA	550	500	450	400	300	120
	Decade 2	NA	90	130	70	70	50	40
	Decade 5	NA	40	50	40	20	10	10
Final Harvests [2]	M Acres							
	Decade 1	144	121	125	102	91	99	33
	Decade 2	NA	121	126	100	92	100	27
	Decade 5	NA	116	118	82	81	85	23

[1]FORPLAN was not used with this Alternative. NA means the information is not available. Road construction miles are estimated to be similar to Alternative B-Departure.
[2]Final harvests include clearcuts and shelterwoods only.

The quantity and timing of water flow is expected to vary only slightly between alternatives.

The quality of water, and the stability of the stream channels is described in terms of risk of adverse cumulative effects to these resources. Alternatives J, W, D, and L increase the risk of adverse changes to water quality and of stream channel condition when compared with a continuation of current direction (Alternative A), Alternative K or the NC alternative. All alternatives increase the risk of adverse cumulative changes to water quality and stream channel conditions when compared with the average natural conditions. The relative differences in risk between alternatives is shown in the Table II-18.

Table II-18. Cumulative Watershed Effects Summary

	Alternatives[1]						
Risk Category [2]	**NC [3]**	**K**	**A**	**J**	**W**	**D**	**L**
High Risk	NA	29	28	18	0	12	0
Moderate Risk	NA	27	25	17	0	10	0
Low Risk	NA	44	47	65	100	78	100

[1]Values presented are the percent of the Forest in each category in the 1st decade.
[2]See Chapter IV and Appendix B for description of risk.
[3]Data is not available. Alternative NC would be expected to produce greater effects than Alternative B-Departure (DEIS).

Mineral Resources

Regulation of mineral and energy related activities on National Forest System lands is shared with the Bureau of Land Management (BLM). Regulation of mineral and energy exploration and development are indirectly influenced by the proposed land use allocations and their associated management prescriptions. Factors that determine the degree of mineral exploration and development that may occur are the availability of access, the objectives for each management area, the demand for minerals, and geologic potential. Access and management area objectives are the factors that vary by alternative.

The Forest will recommend to the BLM that land allocations that place a high emphasis on the protection of resources such as visual quality, recreation, wildlife habitat, and special or unique areas, be withdrawn from mineral entry. In other cases, restrictions such as use periods, surface protection measures, and rehabilitation requirements may be required. Access for exploration may also be limited because of the lack of existing roads and other resource developments.

Management prescriptions affect the availability of the land for mineral exploration and development. All Forest lands are in one of three levels of availability; open, restricted or withdrawn.

Open lands for locatable minerals and energy development or leasing are in areas where management designations do not require special mitigative measures, although restrictive lease stipulations or operating plan conditions may be required to mitigate for situations such as unstable soils or visual sensitivity. In general, standard field practices for mining and mineral lease activities can be used.

Restricted lands are available for locatable minerals and energy development or leasing with specific requirements that significantly affect access and ground disturbing activities. This includes management areas where resource considerations require special mitigative measures.

Withdrawn lands are unavailable for locatable minerals and energy development and/or leasing because of other resource values or investments. The Bureau of Land Management reviews all agency withdrawal recommendations and makes recommendations to the Secretary of Interior.

Table II-19 shows the effect of the alternatives on accessibility for exploration and development of locatable minerals. The mineral resource program on the Forest is compared among the alternatives by determining the acres available for mineral exploration and development activities and in terms of regulatory constraints.

Table II-19. Acres Withdrawn, Restricted or Open For Minerals

	Alternatives						
Availability of Minerals	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Withdrawn							
Nondiscrectionary[1]	402,252	402,252	402,252	402,252	402,252	402,252	571,602
Discrectionary	29,789	149,951	137,131	168,807	190,796	209,300	329,249
Restricted	92,273	50,637	89,116	104,389	154,066	258,592	208,183
Open	1,097,110	1,072,580	1,046,921	999,972	928,306	805,276	566,376

[1] Includes existing and proposed Wilderness, H.J. Andrews Experimental Forest and the Oregon Cascades NRA.

The Alternatives propose varying levels of lands open to minerals developments ranging from 43% of the Forest landbase in Alternative L to 65% in Alternative NC.

About 44,600 acres on the Forest have moderate potential for locatable minerals with the remaining 1,630,800 acres having low or unknown potential. Of the acres with moderate potential, 8,319 are legislatively or administratively withdrawn.

Approximately 18,344 acres on the Forest have moderate potential for geothermal resources, 178,550 acres have low potential and 1,478,510 acres with no know potential. Of this, about 491 acres are legislatively or administratively withdrawn.

The USDI Bureau of Land Management has not classified the Forest as to its prospective value as an oil and gas producer. Currently there area about 20,700 acres in leases for oil and gas. The alternatives affect oil and gas exploration and development much in the same way as locatable minerals are affected.

The Forest Service has total management responsibility for the disposal of salable minerals which include minerals such as sand, stone, gravel, cinders, pumice, pumicite, and clay.These minerals are extracted from surface and subsurface layers and are used mostly for road construction and maintenance. Restrictions on this category are similiar to those described for locatable minerals.

Energy

Table II-20 shows the estimated net energy balance for each Alternative. The table shows the difference between the estimated energy requirements and the energy outputs for each Alternative. The values in the table are all negative which indicates that implementation of any Alternative would consume more energy than it would produce. Existing and potential hydropower as well as potential geothermal energy production were not included in the estimates. These production levels would be constant across all Alternatives. Examples of items which were used to calculate energy input are:

- Timber - Logging, construction and reconstruction of roads, transport to mill, processing.
- Fuels - Fuel treatment
- Recreation - Developed recreation construction, operation and maintenance, and recreational travel.

In general, alternatives with higher levels of timber harvest would have higher levels of energy consumption. Increased emphasis on developed recreation and motorized dispersed would also tend to increase total energy consumption, however, this varies less among the alternatives than the energy consumed in timber harvesting and related activities.

Table II-20. Average Annual Net Energy Balance

	Alternatives						
Decade	NC	K	A	J	W	D	L
1st	-13,300	-13,517	-13,300	-12,375	-10,774	-8,523	-7,261
2nd	-13,255	-13,681	-13,255	-12,469	-11,007	-9,344	-7,933
5th	-10,610	10,894	-10,610	-10,219	-8,549	-7,594	-6,411

Roads

The road transportation network currently consists of 6600 miles of road. Most present and future transportation needs are accomodated with the current system.

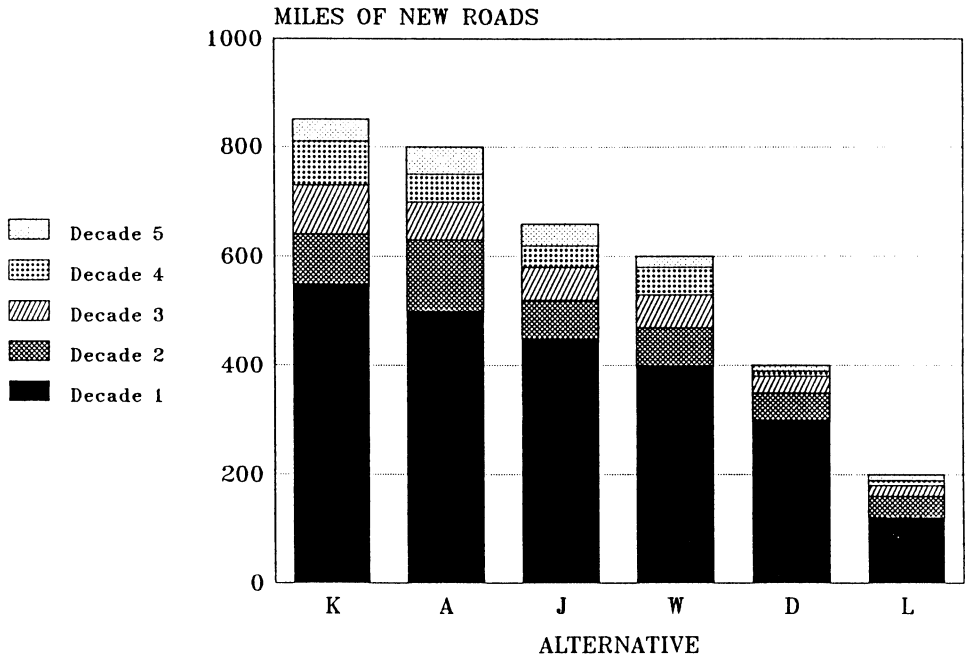
Additional access would be needed during the planning period to accomplish timber, recreation, and administrative objectives in all alternatives. The miles of new road construction would vary by alternative in direct proportion to the level of timber harvest.

The Forest road system would be at least 97% complete for all alternatives by the end of the second decade. Beyond that, additional access needs will diminish.

Roads would be reconstructed, maintained, and managed to meet objectives for recreation, water quality, wildlife management, and other resources. Roads which are no longer needed for present or future access would be permanently closed, stabilized, and revegetated.

Figure II-14 shows the new road construction for each Alternative. The amount of miles in each of these categories is directly proportional to the amount of timber scheduled for harvest.

Figure II-14. Road Construction by Alternative



			Alternatives						
Output	**Unit**	**Decade**	**NC [1]**	**K**	**A**	**J**	**W**	**D**	**L**
Road Construction	Miles	1	NA	550	500	450	400	300	120
		2	NA	90	130	70	70	50	40
		3	NA	90	70	60	60	30	20
		4	NA	90	70	60	60	30	20
		5	NA	40	50	40	20	10	10
Total			NA	850	800	700	600	400	200

[1]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model.

Residue Treatment

All alternatives would require the treatment of some woody residues following timber harvest. Fire would be used as the primary management tool in all alternatives to reduce levels of residues from timber harvest to meet resource objectives. Such objectives would be the reduction of wildfire hazard, increasing the success of reforestation activities, and occasionally to create conditions favorable to the establishment of wildlife forage. The primary method of treatment would be broadcast burning, although underburning and pile burning would also be used.

The number of acres burned would be dependent on the number of acres with timber harvest (See Timber section), the type of timber harvested, and other resource objectives. Where old-growth timber is harvested, approximately 80% of the acres would require some residue reduction. Harvest of second-growth stands results in less residues, and approximately 50% of these harvest areas would be treated.

The number of acres treated annually would also be dependent on timing restrictions needed to meet objectives for air quality, soil, and water resources. Currently, to meet air quality regulations, no burning in done between July 4 and Labor Day. Prescriptions for protecting soil and water resources require that areas would be treated with "cool" burns, thus limiting the number of days suited to burning to those when particular climatic conditions occur. The number of acres burned would also be dependent on the amount of time when fuels are dry enough, and be influenced by precipitation patterns.

In those alternatives with fewer harvest acres, fewer acres would be treated with fire.

Resource Outputs, Environmental Effects, Activities And Costs

The quantitative resource outputs, environmental effects, activities, and costs associated with each Alternative are presented in Table II-22. These results have been grouped by resources. For most resources the acres allocated the activities scheduled, and the outputs or effects are reported. Costs and other economic estimates appear at the end of the table. The alternatives are ordered across the top of these Tables in the sequence of decreasing acres suitable for timber management. Unless otherwise noted, output and effect figures represent total results: direct, indirect, induced, and cumulative. All numbers represent average annual totals for the indicated decade.

The qualitative effects of the Alternatives are presented in Table II-21. Please note that the entries in Table II-21 are brief, simplistic summaries of qualitative effects that are generally quite complex. Reference to the detailed discussions in Chapter IV is needed to gain full understanding of these effects.

Many of the outputs and effects displayed in these Tables are derived from the analysis described in Appendix B. Detailed coverage of many of the results of this analysis can be found in Chapter IV. Consult these sections for further information regarding analytical procedures, results, and interpretations.

Table II-21. Resource Outputs, Effects, Activities, and Costs

Output/Effects	Unit	Decade	Alternatives						
			NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Water									
Low Watershed Impact	% Area	1	NA	44	47	65	100	78	100
Moderate Watershed Impact		1	NA	27	25	17	0	10	0
High Watershed Impact		1	NA	29	28	18	0	12	0
Erosion (Debris Slides)	M Cu-Yd	1	NA	85.6	80.3	67.0	34.0	33.4	23.9
Water Yield	M Ac-Ft	1	8,895	8,895	8,895	8,895	8,895	8,895	8,895
		2	8,895	8,895	8,895	8,895	8,895	8,895	8,895
		5	8,895	8,895	8,895	8,895	8,895	8,895	8,895
Lands Tentatively Suitable for Timber Production	M Acres	-	1,136.4	1,032.1	1,032.1	1,032.1	1,032.1	1,032.1	1,032.1
Lands Suitable for Timber Production	M Acres	-	1,064.6	932.8	874.3	853.4	774.6	719.4	553.1
Lands by Timber Yield Levels									
Full Yield (95-100%)	M Acres	-	918.7	797.0	743.4	719.6	689.2	638.9	314.3
75-94% of Full Yield	M Acres	-	54.0	70.3	71.3	72.6	42.9	40.4	74.9
50-74% of Full Yield	M Acres	-	91.9	65.5	59.6	61.2	42.5	40.1	89.0
1-49% of Full Yield	M Acres	-	0	0	0	0	0	0	74.9
Tentatively Scheduled Timber Harvest									
Clearcut [2]	M Acres	1	14.4	12.6	12.1	10.2	9.1	9.9	3.3
		2	NA	12.6	12.1	10.0	9.4	10.0	2.8
		5	NA	11.8	11.6	8.2	8.1	8.5	2.3
Commercial Thin	M Acres	1	4.2	3.1	3.2	2.6	2.8	2.7	0.2
		2	NA	0.2	0.2	1.7	2.1	0.3	0.9
		5	NA	2.8	1.3	10.1	6.8	5.5	4.9
Reforestation	M Acres	1	14.4	12.6	12.1	10.2	9.1	9.9	3.3
		2	NA	12.6	12.1	10.0	9.4	10.0	2.8
		5	NA	11.8	11.6	8.2	8.1	8.5	2.3
Timber Stand Improvement [3]	M Acres	1	12.9	21.3	20.7	20.4	18.1	19.3	8.1
		2	NA	22.8	22.8	18.3	17.7	18.0	5.8
		5	NA	21.7	21.7	16.7	17.8	15.5	5.4
Timber Sale Program Quantity [4]	MMBF	1	1,013	799	748	652	604	586	185
		2	NA	810	760	654	596	597	190
		5	NA	621	555	558	495	438	142

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Timber Sale Program Quantity [4]	MMCF	1	183	144	135	116	107	105	33
		2	NA	144	135	116	107	106	33
		5	NA	127	117	110	98	92	30
Allowable Sale Quantity [5]	MMBF	1	810	650	608	530	491	476	150
		2	810	658	618	532	484	486	155
		5	810	573	532	481	440	407	129
Allowable Sale Quantity [5]	MMCF	1	146	117	110	95	87	86	27
		2	146	117	110	95	87	86	27
		5	146	117	110	95	87	86	27
Long-Term Sustained Yield	MMCF	-	146.0	120.0	113.5	107.8	94.7	93.8	34.2
Firewood [6]	M Cords	1	71.9	57.0	53.6	46.2	42.4	41.8	13.5
		2	NA	57.0	53.6	46.2	42.4	41.9	13.5
		5	NA	24.2	19.2	33.8	25.0	16.4	6.8
Timber Growth in 5th Decade	MMCF	-	NA	112.1	105.9	102.8	88.9	91.0	33.9
Old Growth at End of Decade[7]	M Acres	1	494.0	522.4	528.4	534.9	533.4	537.2	578.3
		2	NA	449.7	460.9	473.6	479.1	478.4	558.1
		5	259.8	305.1	337.0	341.1	365.2	367.8	523.1
Fuel Treatment	M Acre	1	8.6	7.6	7.3	6.1	5.5	5.9	2.0
		2	NA	7.6	7.3	6.0	5.6	6.0	1.7
		3	NA	7.1	7.0	4.9	4.9	5.1	1.4
Anadromous Smolt Habitat Capability	M Smolt	1	NA	409	410	411	438	433	437
		2	NA	536	536	538	572	567	572
		5	NA	536	536	538	572	567	572
Resident Fish Production Capability	M Legal Size	1	NA	2427	2427	2427	2506	2506	2506
Bald Eagle	Protected Sites[8]	-	21	21	21	24	24	27	27
Spotted Owl Habitat Areas	Areas	-	NA	59	59	59	59	102	184
Pileated Woodpeckers	Areas [9]	-	NA	156	156	156	156	274	355
Marten	Areas [9]	-	NA	256	256	256	256	412	438

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Primary Cavity Excavators	% Bio. Poten- tial	1	NA	40	38	41	43	44	49
		2	NA	43	43	43	45	46	49
		5	NA	40	41	42	45	45	49
Elk	PTI [10]	1	NA	1.0	1.1	1.2	1.3	1.5	1.5
		2	NA	0.97	1.2	1.3	1.6	2.0	1.9
		5	NA	0.91	1.2	1.2	1.5	2.4	1.9
Deer	PTI [10]	1	NA	1.0	1.1	1.3	1.4	1.6	1.5
		2	NA	0.98	1.2	1.6	1.7	2.1	2.0
		5	NA	0.96	1.2	1.3	1.6	2.5	2.0
Consumptive Wildlife Use	MWFUDs	1	NA	108	117	129	145	157	157
		2	NA	104	125	145	177	217	206
		5	NA	99	125	129	168	263	206
Nonconsumptive Wildlife Use	MWFUDs	1	NA	704	758	841	941	1021	1021
		2	NA	674	811	941	1153	1338	1409
		5	NA	644	811	841	1049	1338	1708
Acres of Unroaded Areas Still Meeting Roadless Definitions at the End of the Decade.	M Acres	1	84.9	104.9	70.8	42.0	52.7	0.8	16.3
		2	45.7	65.7	22.7	23.2	30.6	0.0	12.9
		5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unroaded Areas Assigned to Unroaded Rx	M Acres	-	45.4	25.3	59.8	79.7	92.1	136.9	145.9
Visual Quality Objectives									
Preservation	M Acres	-	437.9	503.8	547.4	586.4	591.1	647.7	912.8
Retention	M Acres	-	88.6	72.0	77.9	90.5	118.8	142.1	265.1
Partial Retention	M Acres	-	114.3	147.5	150.1	177.7	171.7	245.7	286.3
Modification	M Acres	-	4.5	123.6	4.5	206.2	143.0	108.4	4.5
Maximum Modification	M Acres	-	1,030.1	828.6	895.4	614.6	650.8	531.6	210.6
Trail Construction	Miles	1	0	0	0	4.0	6.0	6.8	4.0
		2	0	0	0	0	0	0	0
		5	0	0	0	0	0	0	0
Trail Reconstruction	Miles	1	68	68	68	70	72	72	70
		2	68	68	68	70	72	72	70
		5	68	68	68	70	72	72	70
Developed Site Construction	PAOT	1	0	390	0	51	327	120	0
		2	0	390	0	20	56	55	0
		5	0	390	0	0	25	0	0

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Developed Site Reconstruction	PAOT	1	844	844	844	844	844	844	844
		2	844	974	844	861	953	884	844
		5	844	1040	844	868	1014	902	844
Developed Recreation Use [11]	MRVDs	1	2,056	2,056	2,056	2,056	2,056	2,056	2,056
		2	2,539	2,953	2,539	2,799	2,953	2,830	2,539
		5	2,539	4,481	5,539	2,799	3,073	2,830	2,539
Wilderness Recreation Use [11]	MRVDs	1	352	352	352	368	342	207	370
		2	415	415	415	401	342	269	447
		5	436	436	436	412	342	283	460
Nonwilderness Dispersed Recreation Use[11 12]									
Semiprimitive Nonmotorized Use	MRVDs	1	52	7	50	54	52	70	52
		2	52	7	50	54	52	90	52
		5	52	7	50	54	52	90	52
Semiprimitive Motorized Use	MRVDs	1	50	64	49	64	64	64	64
		2	50	93	49	69	76	80	93
		5	50	111	49	69	76	80	126
Roaded Natural Use	MRVDs	1	1,054	1,278	1,278	1,278	1,278	1,278	1,278
		2	1,054	1,694	1,764	1,880	1,880	1,880	1,880
		5	1,054	1,694	1,764	2,194	2,310	2,853	2,853
Roaded Modified Use	MRVDs	1	376	376	376	376	376	376	376
		2	553	553	553	553	553	553	382
		5	839	839	839	839	839	839	382
Road Construction	Miles	1	82	55	50	45	40	30	12
		2	36	9	13	7	7	5	4
		5	0	4	5	4	2	1	1
Road Reconstruction	Miles	1	236	222	204	178	174	153	81
		2	NA	220	202	176	171	151	79
		5	NA	220	202	176	171	151	79
Roads Suitable For Public Use									
Passenger Car	Miles	1	1,735	1,580	1,610	1,600	1,580	1,580	1,580
		2	NA	1,585	1,660	1,640	1,585	1,585	1,585
		5	NA	1,585	1,670	1,650	1,585	1,585	1,585
High Clearance Vehicles Only	Miles	1	4,600	4,600	4,560	4,530	4,530	4,500	4,200
		2	NA	4,700	4,770	4,700	4,550	4,520	4,220
		5	NA	4,760	4,820	4,740	4,570	4,550	4,230
Closed to Motor Vehicles	Miles	1	1,085	970	930	920	890	820	935
		2	NA	955	800	820	935	845	955
		3	NA	1,105	910	910	1,045	865	985

Output/Effects	Unit	Decade	NC [1] (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
Total Budget (1982 $)	Million $	1	NA	62.6	58.2	52.2	49.2	49.6	26.4
		2	NA	56.1	52.5	47.8	46.2	45.5	25.0
		5	NA	55.7	51.4	49.5	45.2	46.1	26.3
Present Net Value (15 Decade Total)	Million $	-	NA	3,503	3,184	3,060	2,858	2,780	1,607
Returns to Government	Million $	1	166.2	128.6	119.9	106.1	101.2	91.8	32.4
		2	NA	151.6	141.5	122.6	108.0	109.9	40.3
		5	NA	143.7	130.2	135.6	117.6	97.8	32.5
Payments to Counties	Million $	1	41.6	32.2	30.0	26.5	25.3	23.0	8.1
		2	NA	37.9	35.4	30.6	27.0	27.5	10.1
		5	NA	35.9	32.6	33.9	29.4	24.4	8.1
Change in Jobs (Relative to Historic level = 13,257)	Number	1	5,653	2,945	2,219	900	204	-167	-5,499
Change in Jobs (Relative to Alternative NC = 16,303)	Number	1	--	-2,078	-3,434	-4,753	-5,449	-5,820	-11,152
Change in Income (1982 $) (Historic Level = 340.4)	Million $	1	155.7	73.9	52.7	14.3	-5.6	-15.1	-172.8

Footnotes for Table II-21.

[1] NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. Section D4b, of Chapter II in the DEIS describes these differences.
[2] Approximately 7% of these acres would be shelterwood harvests
[3] TSI includes release from competing vegetation, precommercial thinning, and fertilization.
[4] Includes net green volume plus salvage, cull, unregulated, and miscellaneous convertible products. The average annual amount of timber sold 1977-1986 was 784 MMBF, and the amount harvested was 607 MMBF.
[5] Includes only live, sound wood.
[6] Historically the firewood supply has come from a portion of the cull material, and is included in the Timber Sale Program Quantity above.
[7] Old growth based on the Pacific Northwest Regional Guide definition.
[8] Includes both existing and potential habitat areas.
[9] Areas include contributing habitat from SOHAs and/or pileated woodpecker habitat.
[10] Population Trend Index; Population trend values by decade are compared to a current level of 1.00.
[11] Recreation visitor day use for the No Change Alternative was developed from previous inventories and yield tables and does not incorporate the latest methods of calculating RVD outputs.
[12] RVD outputs for the No Change Alternative are available for total dispersed use.
MRVDs = Thousands of Recreation Visitor Days
PAOT = Persons at One Time
M Acres = Thousand Acres
MWFUDs = Thousand of Wildlife and Fish User Days
M Smolt = Thousand Smolt (Young Anadromous Fish)
PTI = Population Trend Index%/bio-pot = Percent of Bio-potential
AUMs = Animal Unit Months
MMBF = Million Board Feet
MMCF = Million Cubic Feet
M Ac-Ft = Thousand Acre-Feet
Cu. Yds/Yr = Cubic Yards per Year
Additional information about these terms is included in the Glossary

Table II-22. Qualitative Resource Outputs, Environmental and Social Effects

1. The rate of change in scenic areas on the Forest.	
NC	Most areas of high scenic importance will change rapidly from natural appearing, slightly altered, and moderately altered landscapes to a condition that appears heavily altered.
K	Most areas of high scenic importance will change dramatically from natural appearing, slightly altered and moderately altered landscapes to a condition that appears heavily altered.
A	Most areas of high scenic importance will change rapidly from a natural appearing, slightly altered or moderately altered appearance to a landscape condition that appears moderately to heavily altered.
J	Most areas of high scenic importance will change gradually form natural appearing and slightly altered landscapes to landscape conditions that appear moderately to heavily altered.
W	Most areas of high scenic importance will change gradually from a natural or slightly altered appearance to landscape conditions that range between slightly altered and moderately altered.
D	Most areas of high scenic importance will change slowly. Areas that now appear moderately or heavily altered will,in time, recover to conditions that appear slightly altered. Other areas will remain or become natural appearing.
L	Most areas of high scenic importance will change very slowly in appearance from current conditions due to management activities. Changes in many areas of the Forest will be the result of natural processes. Areas that currently appear moderately to heavily altered will in time recover to a natural or slightly altered appearance.
2. Diversity of recreation opportunities.	
NC	Provides a wide range of dispersed recreation opportunities with an equal emphasis on semiprimitive motor and nonmotorized activities. Provides a high degree of off-road vehicle access to Forest lands. All existing public and privately managed developed recreation sites will remain open. The current trail system is maintained.
K	Emphasis is placed on Roaded Natural and Roaded Modified recreation opportunities with a minor amount of area provided for semiprimitive opportunities. Provides the highest degree of off-road vehicle access to Forest lands. All existing public and privately managed developed recreation sites will remain open and new sites would be developed to keep pace with user demand. The current trail system is maintained.
A	Provides a wide range of dispersed recreation opportunities with an equal emphasis on semiprimitive motor and nonmotorized activities. Provides a high degree of off-road vehicle access to Forest lands. All existing public and privately managed developed recreation sites will remain open. The current trail system is maintained.
J	Provides for a wide range of dispersed recreation activities with a moderate emphasis on both semiprimitive motor and nonmotorized opportunities. Provides for a moderate degree of off-road vehicle access to Forest lands. All existing public and privately managed developed recreation sites will remain open and several new sites would be developed 3o meet increases in demand. The current trail system is maintained and forty miles of new trails is proposed for development.
W	Provides for a wide, yet balanced, range of dispersed recreation activities with a moderate emphasis on both semiprimitive motor and nonmotorized opportunities. Provides for a moderate degree of off-road vehicle access to Forest lands. All existing public and privately managed developed recreation sites will remain open and new sites will be developed to meet increases in public demand. The current trail system is maintained and sixty miles of new trails are proposed for development.
D	Provides a balanced range of dispersed recreation activities with a major emphasis on maintaining semiprimitive opportunities. Provides for a modest degree of off-road vehicle access to Forest lands. All existing public and privately managed developed recreation sites will remain open and new sites would be developed to meet increases in future public demand. The current trail system is maintained and 68 miles of new trails are proposed for development.

Table II-22 Cont. Qualitative Resource Outputs, Environmental and Social Effects

L	Provides for a wide range of dispersed recreation activities with a major emphasis on maintaining semiprimitive recreation opportunities. Also provides for the designation of selected areas as Wilderness, and Wilderness Study for others. Provides for a modest degree of off-road vehicle access to Forest lands. All existing public and privately managed developed recreation sites will remain open. The current trail system is maintained and forty miles of new trail is proposed for development.
3. Diversity and distribution of wildlife habitat.	
NC	Lowest rating for diversity and distribution of wildlife habitat. Landscape highly fragmented, special and unique habitat highly impacted.
A	Low rating for diversity. Mininum distribution met for Management Requirements. Habitat for interior forest species becomes isolated in islands with forest landscape highly fragmented. Special and unique habitats highly impacted.
K	Low rating for diversity. Mininum distribution met for Management Requirements. Habitat for interior forest species becomes isolated in islands with forest landscape highly fragmented. Special and unique habitats highly impacted.
J	Low to Moderate rating for diversity. Minimum distribution met for Management Requirement. Dead and defective tree habitat above MR. Interior forest habitat becoming fragmented and isolated in islands. Moderate impact to special and unique habitat.
W	Moderate to High rating for diversity. Minimum distribution met for Management Requirement. Dead and defective tree habitat above MR. Fragmentation of interior forest habitat delayed. Emphasis on providing corridors for connectivity between habitat islands reduces potential for isolation. Low impact to special and unique habitats.
D	Moderate rating for diversity. Distribution exceeds Management Requirements. Dead and defective tree habitat above MR. Interior forest habitat becoming fragmented and isolated in islands. Low impact to special and unique habitat.
L	High rating for diversity. Excellent distribution of habitat exceeds Management Requirements. Dead and defective tree habitat a highest level. Interior forest habitat maintained, fragmentation reduced, connectivity of interior habitats maintained or restored. Low impact to special and unique habitat.
4. Lifestyles	
NC	Jobs will be up considerably, especially timber related employment. Reduced opportunity for semiprimitive and roaded natural recreation types. Demand for hunting and fishing opportunities will be allowed to increase.
K	Jobs will increase from historic levels, especially timber related employment. Develop recreation opportunities will increase considerably, with reduced opportunities in semiprimitive and semiprimitive nonmotorized recreation types. Overall scenic quality will be low to moderate.
A	Jobs will increase from historic level, especially timber related employment. Developed recreation and dispersed recreation will continue to increase for 2 decades. Overall scenic quality will be low to moderate.
J	Overall jobs will increase somewhat from historical levels, but timber related employment will decrease. Recreation and leisure activities would remain about the same as the No Action Alternative with more unroaded recreation opportunities. Overall scenic quality will be moderate to high.
W	Overall jobs will increase slightly from historical levels but timber related employment will decrease. Jobs related to recreation will increase offsetting the loss of timber related jobs. Increase opportunities for all developed and dispersed recreation activities is expected with the exception of a slight decrease in semiprimitive nonmotorized. Overall visual quality will be moderate to high.
D	Timber related jobs would be relatively low within the range of Alternatives. Jobs related to recreation will offset the loss of timber related jobs somewhat but a net loss of jobs is expected. Potential hunting and fishing activities will increase as well as developed and dispersed recreation opportunities. Overall scenic quality will be high.

Table II-22 Cont. Qualitative Resource Outputs, Environmental and Social Effects

L	Jobs will decrease considerably, with timber related jobs the lowest for any Alternative. All types of recreation opportunities will increase. In addition, all roadless areas will be maintained in an unroaded condition.
5. Community Infrastructure	
NC	Increased timber receipts to fund county road and school systems.
K	Increased timber receipts for 4 decades but then decreases slightly. Small expected effect on county road and school systems.
A	Slight increase in timber receipts for the first 5 decades which would keep county road improvements and school funding at or near present levels.
J	Funding for county infrastructure projects would remain above historical levels but funding would vary (increasing then decreasing) for the first 5 decades.
W	Timber receipts will increase for 4 decades starting above historical levels; however, funding for county infrastructure will remain lower than current levels for the first 4 decades.
D	Timber receipts near historical average.
L	Drastic reduction (about three-quarter) of timber related receipts to counties. County infrastructures would be negatively affected as less money would be received from Federal timber receipts.

Response To Issues And Concerns

One of the primary reasons for developing Alternatives is to provide a variety of responses to the issues and concerns affecting the Forest and the public. Each Alternative represents a unique approach to issue resolution. While all Alternatives address the entire range of issues and concerns, none can successfully resolve all of them concurrently. This is because the issues and concerns reflect the full range of desires for, use of, and outputs from, a limited land and resource base. Some of these outputs and uses are competitive or mutually exclusive, thus creating the need for a variety of issue resolution packages or Alternatives.

Table II-23 displays in narrative terms the responsiveness of each Alternative to the major issues described in Chapter I. The results are presented here in words to assist in interpretation of the Alternatives. Each of the issues also has a set of quantified indicators of responsiveness that are presented in Table II-27 and described in Appendix A. The final section of this Chapter includes a discussion of trade-offs between quantified indicators.

Table II-23. Comparison of Issue and Concern Resolution by Alternative

1. Old Growth - Amount of existing old growth remaining after 5 decades of harvest. There are currently 594,800 acres which meet the Region Six definition of old growth.	
NC	Maintains 44% of existing old growth (259,800 acres).
K	Maintains 51% of existing old growth (305,100 acres).
A	Maintains 57% of existing old growth (337,000 acres).
J	Maintains 57% of existing old growth (341,400 acres).
W	Maintains 61% of existing old growth (365,200 acres).
D	Maintains 62% of existing old growth (367,800 acres).
L	Maintains 88% of existing old growth (523,100 acres).
2. Dispersed Recreation - Percent of Forest's inventoried potential semiprimitive motor and nonmotorized recreation opporuntities provided.	
NC	Maintains 33% of the Forest's dispersed semiprimitive motor and nonmotorized opportunities; 27% motor and 6% nonmotorized.
K	Maintains 21% of the Forest's dispersed semiprimitive motor and nonmotorized opportunities 6% motor and 15% nonmotorized.
A	Maintains 32% of the Forest's dispersed semiprimitive motor and nonmotorized opportunities 26% motor and 6% nonmotorized.
J	Maintains 39% of the Forest's dispersed semiprimitive motor and nonmotorized opportunities 32% motor and 7% nonmotorized.
W	Maintains 39% of the Forest's dispersed semiprimitive motor and nonmotorized opportunities 31% motor and 8% nonmotorized.
D	Maintains 71% of the Forest's dispersed semiprimitive motor and nonmotorized opportunities 63% motor and 8% nonmotorized.
L	Maintains 66% of the Forest's dispersed semiprimitive motor and nonmotorized opportunities 64% motor and 2% nonmotorized.
3. Roadless Lands - Inventoried Lands to be maintained in an undeveloped condition.	
NC	Maintains 26% (45,400 ac.) of the Forest's Inventoried Roadless Areas in an undeveloped condition.
K	Maintains 15% (25,300 ac.) of the Forest's Inventoried Roadless Areas in an undeveloped condition.
A	Maintains 35% (59,800 ac.) of the Forest's Inventoried Roadless Areas in an undeveloped condition.
J	Maintains 46% (79,700 ac.) of the Forest's Inventoried Roadless Areas in an undeveloped condition.
W	Maintains 53% (92,100 ac.) of the Forest's Inventoried Roadless Areas in an undeveloped condition.
D	Maintains 80% (136,900 ac.) of the Forest's Inventoried Roadless Areas in an undeveloped condition.
L	Maintains 85% (145,900 ac.) of the Forest's Inventoried Roadless Areas in an undeveloped condition.
4. Scenic Quality - Expected future condition of the Forest's 10 major viewsheds.	
NC	One of the Forest's 10 viewsheds will be maintained in a natural appearing condition, 2 will remain or become moderately altered, and 7 will appear heavily altered.

K	None of the Forest's 10 viewsheds will be maintained in a natural appearing or slightly altered condition, 3 will remain or become moderately altered, and 7 will appear heavily altered.
A	One of the Forest's 10 viewsheds will be maintained in a natural appearing condition, none will become slightly altered, 2 will remain or become moderately altered, and 7 will appear heavily altered.
J	One of the Forest's 10 viewsheds will be maintained in a natural appearing condition, however, 3 will be maintained in a slightly altered condition, 5 will remain or become moderately altered, and 1 will appear heavily altered.
W	One of the Forest's 10 viewsheds will be maintained in a natural appearing condition, 4 in a slightly altered condition,5 will remain or become moderately altered, and none will appear heavily altered.
D	Six of the Forest's 10 viewsheds will be maintained in a natural appearing condition, 4 in a slightly altered condition, and none of the areas will appear moderately or heavily altered.
L	Seven of the Forest's 10 viewsheds will be maintained in a natural appearing condition, 3 in a slightly altered condition, and none of the areas will appear moderately or heavily altered.
5. Allowable Sale Quantity - Amount of timber estimated to be sold annually (in million board feet), and the acres suitable for timber management.	
NC	This alternative represents the potential yield of the current TM Plan, with an ASQ of 810 MMBF, 26% above the current Proposed Program. The suited landbase is 1,064,600 acres.
K	The ASQ is 650 MMBF, which is 1% above the current program level, on a suited landbase of 932,800 acres.
A	The ASQ is 608 MMBF, which is 94% of the current program level, with a suited landbase of 874,300 acres.
J	The ASQ is 530 MMBF, which is 82% of the current program level, with a suited landbase of 853,400 acres.
W	The ASQ is 491 MMBF, which is 76% of the current program level, with a suited landbase of 774,600 acres.
D	The ASQ is 476 MMBF, which is 74% of the current program level, with a suited landbase of 719,400 acres.
L	The ASQ is 150 MMBF, which is 23% of the current program level, with a suited landbase of 553,100 acres.
6. Water Quality - Risk to water quality and stream conditions.	
NC	Approximately half of the forest land is at High Risk of adverse effects to water quality and stream conditions, because the levels of timber harvest result in hydrological recovery below the desired levels, because of the cumulative effects of timber harvest in riparian areas of Class I, II, and III streams, and the risk associated with harvest of steep potentially unstable areas adjacent to Class IV streams.
K	Approximately 29% of the Forest is at high risk; 27% at moderate risk; and 44% at low risk. The risk is associated with reasons described for Alternative NC.
A	Approximately 28% of the Forest is at high risk; 25% at moderate risk; and 47% at low risk. The risk is associated with reasons described for Alternative NC.
J	Approximately 18% of the Forest is at high risk; 17% at moderate risk; and 65% at low risk. The risk is associated with reasons described for Alternative NC.
W	All of the Forest is at Low Risk, due to the harvest level compatible with desired levels of hydrological recovery, to full protection of riparian areas along Class I, II, and III streams, and provisions for protection of potentially unstable Class IV streams.
D	Approximately 12% of the Forest is at High Risk, 10% is at moderate risk; and 78% is at low risk. The relatively low risk is associated with protection of Class I and II riparian areas, and the relatively low level of timber harvest.
L	All of the Forest is at Low Risk due to the low level of harvest, full riparian protection on Class I, II, and III streams, and provisions for protection of potentially unstable Class IV streams.

7. Wildlife and Sensitive Plant Habitat - Elk and Deer, Mature and Old Growth Habitat, Plant habitat, Dead and Defective Tree Habitat, Habitat for T&E Species.	
NC	Elk and deer habitat capability declines rapidly leaving existing popualtions at high risk for winter mortality. Mature and old growth habitat isolated within Wilderness and in small isolated islands. Sensitive plant habitat highly impacted. Dead and defective tree habitat poorly distributed with potential loss of many snag dependent species. T&E species protected at minimum levels required by Recovery Plans.
K	Elk and deer habitat capability declines below existing condition with few areas managed for habitat quality. Some existing populations at high risk for winter mortality. Mature and old growth habitat isolated in wilderness and in habitat networks established to meet Management Requirements. Sensitive plant habitat highly impacted as most of the landscape outside wilderness is converted to managed plantations. Dead and defective tree habitat distributed with moderate amounts of habitat for dependent species. T&E species protected at minimum levels required by Recovery Plans.
A	Elk and deer habitat capability declines in some areas and improves in others. Slightly increased potential for populations, but some local populations at high risk for winter mortality. Mature and old growth habitat isolated in wilderness and in habitat networks established to meet Management Requirements. Sensitive plant habitat highly impacted as most of the landscape outside wilderness is converted to managed plantations. Dead and defective tree habitat poorly distributed with low amounts of habitat for dependent species. T&E species protected at minimum levels required by Recovery Plans.
J	Elk and deer habitat capability increases above existing condition with specific areas managed for habitat quality. Optimal cover provided on some winter ranges reducing risk for winter mortality. Mature and old growth habitat isolated in wilderness and in habitat networks established to meet Management Requirements. Sensitive plant habitat moderately impacted as most of the landscape outside wilderness is converted to managed plantations, and only portions of the perimeter of special and unique habitats protected. Dead and defective tree habitat distributed with moderate amounts of habitat for dependent species. T&E species protected at minimum levels required by Recovery Plans.
W	Elk and deer habitat capability increases above existing condition with specific areas managed for habitat quality. Optimal cover provided on some winter ranges reducing risk for winter mortality. Mature and old growth habitat in Wilderness and in habitat networks are linked by corridors managed to protect riparian resources and maintain vegetation diversity. Sensitive plant habitat protected as the landscape outside wilderness is converted to managed plantations. Perimeters of special and unique habitats protected. Dead and defective tree habitat distributed with moderate amounts of habitat for dependent species. T&E species and habitat protected to meet Recovery Plan objectives.
D	Elk and deer habitat capability increases above existing condition with highest amount of area managed for habitat quality. Optimal cover provided on most winter ranges reducing risk for winter mortality. Mature and old growth habitat in Wilderness, and in habitat networks established above Management Requirements to increases distribution and habitat quality. Sensitive plant habitat protected as lands available for timber production is converted to managed plantations. Perimeters of special and unique habitats protected. Dead and defective tree habitat well distributed with high amounts of habitat for dependent species. T&E species and habitat protected above Recovery Plan objectives.
L	Elk and deer habitat capability increases above existing condition with specific areas managed for habitat quality. Optimal cover provided on all winter ranges reducing risk for winter mortality, but reduced forage openings could limit population potential. Mature and old growth habitat provided at high levels forest-wide with increases in long term habitat capability for interior forest dwelling species. Sensitive plant habitat rarely impacted as most of the landscape outside wilderness recovers from past management practices. Most special and unique habitats protected. Dead and defective tree habitat well distributed with high amounts of habitat for dependent species. T&E species and habitat protected above Recovery Plan objectives.

Economic Comparisons Of Alternatives

The economic implications of alternatives are displayed in Tables II-24, II-25, and II-26. A discussion of the variations in costs, benefits, present net value, and cash flows among alternatives accompanies each table. These economic indicators could not be reasonably estimated for Alternative NC (No Change) since it is based on a set of assumptions different than those of the other alternatives, and could not be modeled with the current Willamette FORPLAN model. Additional detail on the differences is in Chapter II, Alternatives Considered in Detail.

Differences in Present Net Value

Tables II-24 and II-25 present information about the Present Net Value (PNV) of alternatives. Present net value is a quantitative measure of economic efficiency, and thus is a key variable in the comparison of alternatives. It is defined as the difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area. "Discounting" is the procedure used to adjust all future costs and benefits to their present-day equivalent values in order to enable a meaningful comparison of dollar flows through time. A discount rate of 4% has been used. An alternative discount rate of 7-1/8%, sometimes used by the Forest Service, was also evaluated. Since relative rankings of alternatives were unaffected with the 7-1/8% rate, only the 4% rate is shown. The discounted benefit and cost flows represent the potential net dollar returned for each alternative: the larger the PNV, the greater the potential return. For a more detailed discussion of PNV calculation and its significance, refer to Appendix B.

By providing a monetary, quantitative measure of economic efficiency, present net value is a useful indicator of differences among alternatives in terms of their total output of public benefits. A full assessment of net public benefits, however, also requires a consideration of primary benefits and costs that have not been assigned a dollar value. Included in this category are outputs such as increased populations of some wildlife species, and physical conditions such as the maintenance of scenery, and clean water. The value of such outputs and effects cannot be reasonably reflected in dollar terms because the data and/or methodology needed to do so are not available.

Another aspect for describing differences among alternatives and ultimately selecting a preferred alternative is the degree of issue resolution. Secondary benefits and costs, such as employment, are often important for understanding the degree of issue resolution. See the section, Major Trade-Offs Among Alternatives in this chapter for a summary of issue resolution.

Table II-24 displays the present net value, total discounted benefits, and total discounted cost for each alternative. Alternatives are ranked in order of decreasing present net value. The change in PNV criteria between alternatives is also displayed. These changes in PNV between alternatives measure the net economic value of the priced outputs that would be forgone if an alternative with a lower PNV were selected. These differences in PNV would have to be compared against the differences in non-priced benefits for the complete comparison of Alternatives.

Table II-25 disaggregates the benefits and costs. It displays the contributions of specific priced outputs to total benefits and assigns approximate costs to major accounting or budgeting categories. Note that it would be incorrect to assume a direct relationship between the dollar benefits associated with a particular output and the cost figure assigned to the same resource. This is because many Forest-wide outputs are produced jointly and the costs associated with producing any single one cannot be accurately disaggregated and assigned.

Table II-24. Differences in Economic Efficiency Criteria

		Alternatives						
Item	**Units**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Present Net Value PNV	Million $	NA	3,503	3,184	3,060	2,858	2,780	1,607
Difference in PNV		NA	-319	-124	-202	-78	-1173	
Present Value of Costs Discounted Costs	Million $	NA	(3,370)	(3,179)	(2,796)	(2,626)	(2,658)	(1,036)
Difference in Costs		NA	(-191)	(-383)	(-170)	(+32)	(-1,622)	
Present Value of Benefits Discounted Benefits	Million $	NA	6,874	6,363	5,856	5,484	5,438	2,642
Difference in Benefits		NA	-511	-507	-372	-47	-2795	

Table II-25. Present Net Value, Discounted Benefits, and Discounted Costs[1]

Item	Alternative						
	NC[2]	K	A	J	W	D	L
PNV	NA	3,503	3,184	3,060	2,858	2,780	1,607
Discounted Benefits							
Timber	NA	5,465	5,123	4,520	4,131	4,010	1,281
Market Recreation Value	NA	6	5	6	7	6	6
Other	NA	1	1	1	1	1	1
Nonmarket Recreation	NA	1,403	1,234	1,329	1,346	1,421	1,354
Total	NA	6,875	6,363	5,856	5,485	5,438	2,642
Discounted Costs							
Recreation[3]	NA	(145)	(113)	(125)	(140)	(170)	(134)
Fish & Wildlife	NA	(141)	(130)	(103)	(96)	(110)	(79)
Range	NA	(1)	(1)	(1)	(1)	(1)	(1)
Timber[4]	NA	(438)	(421)	(384)	(350)	(356)	(130)
Water/Air/Soils	NA	(38)	(38)	(37)	(36)	(37)	(27)
Minerals/Geology	NA	(8)	(8)	(7)	(6)	(6)	(2)
Lands	NA	(11)	(11)	(11)	(11)	(11)	(11)
Facilities (Roads)	NA	(403)	(376)	(354)	(327)	(284)	(195)
Planning	NA	(2)	(2)	(1)	(1)	(1)	(1)
Protection	NA	(166)	(1,58)	(134)	(124)	(126)	(40)
Administration	NA	(132)	(125)	(108)	(99)	(98)	(33)
Purchaser's Costs	NA	(1,885)	(1,797)	(1,531)	(1,435)	(1,458)	(383)
Total		(3,370)	(3,179)	(2,796)	(2,626)	(2,658)	(1,036)

[1]Direct comparisons of benefits and costs in millions of 1982 dollars displayed for individual resource outputs provide general indications of relationships but may be misleading because many multiple-use outputs have common costs of production which cannot be reliably separated and attributed to individual resources. Alternatives displayed in order of decreasing present net value.

[2]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. The alternative NC Description under "Alternatives Considered in Detail," of Chapter II in the FEIS describes these differences.

[3]Costs are for the Wilderness and recreation programs.

[4]Includes all timber-related costs except roads.

Several of the entries in these two Tables require additional explanation to enhance understanding. Timber benefits are expressed in terms of total pond value (i.e., the value delivered at the mill) rather than stumpage value. This approach was taken to be able to show differences in logging costs between the major drainages within the planning model. Thus, the total discounted benefits shown in Table II-24 and the timber benefits in Table II-25 include the value added by logging. The same thing applies on the cost side. In Table II-25 the total logging costs are referred to as "Purchaser's Costs." The total discounted costs in Table II-24 and Table II-25 include logging costs. Non-market recreation represents priced output used for analysis, but not actually six collected as cash receipts.

This approach does not affect the PNV calculation because the value added by logging is offset by the logging costs. The content of the other cost and benefit categories is explained in footnotes below each Table.

Variations in present net value among alternatives are due to the wide range of possible costs and benefits represented in the alternatives. Each alternative is designed to produce a unique set of both priced and nonpriced outputs and effects, each of which generates a distinct pattern of values and costs.

The principal factors influencing the level of priced benefits, costs, and present net value on the Willamette National Forest are the amount and timing of timber harvest. Since this activity has relatively large investment costs and dollar returns associated with it, the volume harvested is the primary determinant of the magnitude of the economic criteria in each alternative. The timing of harvest of is also very important. Discounting diminishes the contribution to PNV of returns gained in the later decades. This means that harvesting high value timber (such as old growth Douglas fir) at full yield as early as possible will provide the highest market values. This effect is illustrated by comparing the acres harvested in decade 1 between alternatives W and D. Even though Alternative D harvests more acres than Alternative W, Alternative W has a higher timber volume and higher PNV than Alternative D. This is because Alternative W harvests more large saw and old growth Douglas fir/Hemlock in the first few decades than D. See Table II-22, Clearcut Acres, for the acres harvested and Table II-24 for the PNV's. These values must be weighed against the loss of non-priced benefits when comparing any two alternatives.

Differences in the amount and timing of land availability accounts for the primary differences in present net value, benefits, and costs. Nonmarket outputs, such as semiprimitive recreation opportunities, anadromous fish production, and fish and wildlife use, cannot compete with timber harvest economically and would not be produced at levels that affect timber harvest volumes or schedules based solely on economic efficiency criteria. Objectives for these resources can only be achieved through the use of constraints, specific prescriptions, or land allocations. Generally, an alternative designed to achieve objectives related to these types of resources will have lower timber harvest levels but higher recreation and fisheries benefits. As a result, differences in PNV between low-timber alternatives and high-timber alternatives are somewhat smaller than if timber was the only resource having an economic value. Some of these differences can be seen in Table II-25. Note that Alternatives K and L show exceptions to this general trend. Alternative K shows a high discounted benefit for nonmarket recreation even though it has the highest level of timber harvest. This is because of the emphasis placed on developed and motorized recreation in K. Alternative L shows a decrease in nonmarket recreation discounted benefits from Alternative D, even though L harvests less timber than D. This is because of L's emphasis on non-roaded allocations allows fewer acres to contribute toward roaded recreational opportunities. When making comparisons such as these, one must consider the overall desired mix of recreational opportunities, not just the composite discounted value.

The production of some priced outputs is not related to timber harvest but does vary based on different levels of management provided. Outputs in this category include domestic livestock grazing use, wilderness use, and developed recreation use. Some of the administrative and support costs of the agency remain constant across all alternatives. These are included in the cost categories of Table II-25.

In addition to the priced outputs discussed above, there are several major outputs, effects or conditions associated with alternatives to which no monetary value can be reasonably assigned. While these outputs are not directly included in the calculation of present net value, they are an important component of issue resolution and, therefore, net public benefits. These outputs and their relationship to priced outputs and PNV include:

- Visual Quality Objectives - As land assigned to visual prescriptions increases, present net value decreases because of restrictions placed on timber harvest. Visual quality objectives are complementary with other amenity-oriented outputs.

- Roadless Area Acreage - Since retention of roadless lands in an unroaded condition and timber harvest are mutually exclusive, increases in roadless acres usually lead to decreases in PNV given the relative values of timber and semiprimitive recreation use. Roadless area retention is complementary with other amenity-oriented outputs.

- Old-Growth Retention - Increasing the amount of old-growth unavailable for harvest has significant impacts on harvest levels and present net value. Because old-growth distribution goals for wildlife and other purposes often dictate that highly productive and readily accessible areas remain unharvested, this nonpriced output can be particularly expensive in terms of PNV. Old-growth retention is complementary to other amenity-oriented outputs.

- Socioeconomic Indicators - Timber harvest is the activity which has the greatest effect on many of the major socioeconomic indicators such as employment, total income, and payments to counties. Production of other priced and nonpriced outputs generally lead to reduced levels for these indicators if their production leads to reduced timber harvest levels.

Numerous other resource management objectives are achieved through land allocations, activity scheduling, or constraints. To the extent that these objectives reduce the available timber harvest land base or restrict harvest through longer rotations, limits in harvest unit sizes, or other means, a reduction in present net value can be expected. The production of both priced and nonpriced outputs are important in the determination of net public benefits.

Economic values associated with potential future production of locatable minerals, oil and gas, geothermal energy or hydroelectric power are not included in the alternatives. The possibility of future development of mineral and energy resources on the Forest does exist. However, the timing of development and the magnitude of production are both highly speculative. It is possible that the economic value of these activities will vary by alternative if they are undertaken.

Differences in Costs

The discounted costs shown in Tables II-24 and II-25 include Forest Service budget costs and costs to others. Non-Forest Service costs are composed primarily of the stump-to-mill costs associated with timber harvest. These represent between 50 and 60% of the total costs of each alternative.

The budget costs associated with each alternative fall into two distinct categories: capital investments and operations/maintenance costs. Capital investments are expenditures on the Forest's physical plant which are designed to provide long-term returns. Examples include road construction, tree planting, and fish habitat improvement structures. Operations/maintenance costs cover those activities which are necessary to conduct the day-to-day business of the Forest. Such things as road maintenance, timber sale administration, and habitat condition monitoring fall into this category.

On the Forest most capital investment costs are for either road construction or activities associated with timber production. These form a substantial part of the projected Forest Service budget for each alternative. Projected annual budget costs in the 1st decade are higher than current levels for all alternatives except L. This is because of the increased emphasis on increasing programs other than timber harvest. Many of the higher costs are for measures to mitigate the adverse effects of timber

harvest. Other major cost increases are due to plans to achieve a more balanced program of resource outputs for recreation, wildlife, soils, water, air quality, and protection. Costs have also increased significantly for planning and administration of NEPA decisions due to the high level of controversy and appeals related to natural resource management. Even though a budget cost for Alternative NC (No Change) was not estimated, a higher budget would also be needed to implement this alternative due to the high harvest level.

Projected budget levels generally parallel harvest levels. The unit costs of harvest-related activities vary considerably, depending on the characteristics of the area in which they occur. For example, the costs of timber sale preparation, fuel treatment, and silvicultural treatments all increase as difficulty of access increases, while road construction costs vary with slope. The development and use of all costs incorporated in the planning analysis is summarized in Appendix B.

Differences in Economic Benefits and Cash Flows

Tables II-24 and II-25 compare alternatives in terms of PNV based on consideration of all values and costs. There are, however, three subcategories of "value" and two of "cost". Value can be disaggregated into non-market value, market value, and Forest Service receipts (which are a part of total market value). Costs can be disaggregated into Forest Service (budget) costs and costs to others.

Total discounted economic benefits associated with market and nonmarket resources are displayed by resource for each alternative in Table II-25. Market resources include timber, recreation user fees, recreation special uses, minerals, and special uses for which fees are collected. Nonmarket resource values are dollar values assigned to dispersed recreation, Wilderness recreation, forms of developed recreation for which no fee is charged, and recreation generated by fish and wildlife. The purpose of assigning dollar values to these is to reflect full economic value, even though none or only part of the value associated with particular resources is actually collected as fees under current laws and policies.

Comparison of total economic benefit to total cost measures the overall economic efficiency of each alternative. Another important consideration is the flow of dollars to and from the U.S. Treasury. In this comparison the important factors are receipts (the portion of total market output collected as fees or payments) and budget costs. The difference between the two is the net cash flow to or from the Treasury. Net cash flows for the 1st, 2nd and 5th decades for each alternative are displayed in Table II-26. The major differences among both economic values and cash receipts are due to different levels of timber production.

The rows labelled "Noncash Benefits" in Table II-26 represent the total estimated dollar value of the nonmarket resources to which values have been assigned. They are presented to give the reader an idea of the relationship between the actual receipts generated by the alternatives and the value of the nonmarket outputs to which values have been assigned.

As discussed earlier, total benefits and total costs are influenced primarily by the level of timber harvest. The same relationship is maintained for cash receipts. Over 99% of the revenues received by the Forest are from the sale of timber. Revenues from other sources are quite small relative to the value of the timber volume harvested.

Differences in noncash benefits in the 1st decade are generally very small due to the relative shifts in the type of recreation program emphasis within each alternative. Alternatives with high timber harvest levels produce more developed and roaded recreation, while those with less timber harvest produce more unroaded recreation. Second and 5th decade noncash benefits reflect anticipated increases in

recreation use which accounts for a general rise in benefits. See the sections on Recreation in Chapters II and IV of this EIS for more details on the mix of recreational opportunities provided by each alternative.

Table II-26. Average Annual Cash Flows [1]

	Alternatives						
Decade	**NC [2]**	**K**	**A**	**J**	**W**	**D**	**L**
Decade 1							
Cash Flow [3]	NA	66	62	54	52	42	6
Total Forest Service Budget [4]	NA	63	58	52	49	50	26
Returns to Government [5]	166	129	120	106	101	92	32
Noncash Benefits [6]	NA	40	41	41	40	38	41
Decade 2							
Cash Flow [3]	NA	96	89	75	62	64	15
Total Forest Service Budget [4]	NA	56	52	48	46	45	25
Returns to Government [5]	NA	152	141	123	108	109	40
Noncash Benefits [6]	NA	55	52	55	55	55	53
Decade 5							
Cash Flow [3]	NA	88	79	86	72	52	6
Total Forest Service Budget [4]	NA	56	52	48	46	45	25
Returns to Government [5]	NA	144	131	136	118	97	32
Noncash Benefits [6]	NA	71	53	60	62	74	63

[1]Millions of 1982 undiscounted dollars displayed in order of decreasing present net value.
[2]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. The Alternative NC Description under "Alternatives Considered in Detail," of Chapter II in the FEIS describes these differences.
[3]The difference between the receipts and costs shown.
[4]Includes all Forest Service costs.
[5]Includes timber stumpage receipts and miscellaneous receipts.
[6]Noncash benefits are those not collected as cash receipts.

Major Trade-Offs Among Alternatives

This section summarizes the relationships among economic values, and the responses of the alternatives to selected issues. The purpose is to highlight major economic and noneconomic trade-offs that can be quantified by using indicators of responsiveness to issues as a means of comparing alternatives. A complete understanding of the differences among alternatives requires reading Chapter II, IV, and Appendix B. The issues are discussed in detail in Chapter I and Appendix A.

To provide a partial framework for assessing trade-offs, the long-term resource demands of the nation, region, and local communities are briefly summarized. Selected economic values and quantified indicators of responsiveness to issues are then tabulated. Finally, differences and similarities among individual alternatives are summarized in terms of major trade-offs among competing objectives or responses to issues.

National, Regional, and Local Overview

The 1984 supplement to the Resources Planning Act (RPA) Assessment estimates that total national demands will rise for all goods and services produced by the National Forests. At the same time, there will be a continuing strong desire to protect and enhance the quality of the environment.

The Regional Guide for the Pacific Northwest Region estimates that demands for all outputs of the National Forest will also rise in Oregon and Washington. Recreation use is expected to increase as the population increases and its characteristics change, with the bulk of recreation use coming from residents of the region. Demand for Wilderness recreation is expected to exceed the available supply within the Region's Wilderness Preservation System.

A survey of recreation associated with fishing, hunting, and wildlife (USDI 1988) indicates that more than three of every four Americans pursue some type of fish or wildlife activity. Demand for hunting and sport fishing is expected to increase by one-third between 1985 and 2000. Nonconsumptive uses of wildlife and fish are also expected to increase.

The National Forests of the Pacific Northwest are the National Forest System's primary timber producer, with almost one-half of the current National Forest harvest coming from this region. The quantity of timber demanded regionally in 2000 is expected to be about 1% greater than the 1976 demand level. The stumpage price of timber, however, is expected to rise substantially.

The local situation is generally similar to that of the Region. Many of the Wilderness and non-Wilderness areas providing primitive and semiprimitive recreation opportunities are currently being used at levels which exceed their capacity to provide high quality experiences. The demand for this type of recreation on the Forest is expected to increase over the next 10 to 50 years.

Demand for timber from the Forest is also projected to increase over the next 10 to 15 years due to anticipated reductions in supply from private and other public lands in the central and southern Willamette Valley together with a strong market for wood products and fiber.

Growth in the recreation and tourism sectors of local and regional economies will add to the economic base, while the timber industry will remain a significant component of the area economy. These trends are discussed more thoroughly in the social and economic environment and timber sections of Chapter III.

Economic Values and Response to Major Issues

Alternatives are developed to provide different responses to public issues identified on the Forest. This section summarizes the quantifiable differences among alternatives in terms of economic criteria and responses to major issues. These issues are discussed in detail in Chapter I. A complete discussion of these indicators and their relationship to the major issues can be found in Appendix A, Issues, Concerns, and Opportunities Identification Process. The following presents another comparison of the responsiveness of alternatives to major issues. The issues and associated indicators of responsiveness include:

- Dispersed Recreation

  Land allocated to semiprimitive nonmotorized uses.
  Land allocated to semiprimitive motorized uses.
  Land allocated to Special Interest Areas.
  Trail construction in the 1st decade.

- Old-Growth

  Amount of old-growth/mature timber retained at the end of the 1st decade.

- Roadless Lands

  Acres of roadless areas left undeveloped.

- Scenic Quality

  Land allocated to a retention Visual Quality Objective.
  Land allocated to a partial retention Visual Quality Objective.
  Land allocated to a modification Visual Quality Objective.

- Timber Supply

  Allowable sale quantity in the 1st decade.
  Long-term sustained yield.

- Water

  Forest area with a "High" Risk watershed risk rating.
  Forest area with a "Moderate" Risk watershed risk rating.
  Forest area with a "Low" Risk watershed risk rating.
  Erosion in the 1st decade (debris slides).

- Wildlife, Fish, and Plant Habitat

  Land managed as spotted owl habitat areas.
  Elk population in the 1st decade.
  Deer population in the 1st decade.

Other indicators of both local and national concern include those which reflect the social and economic effects of alternatives. The quantifiable indicators of these concerns include:

- Present net value over 15 decades.
- Change in jobs in the 1st decade.
- Change in income in the 1st decade.
- Change in payments to counties in the 1st decade.
- Average annual net cash flow in the 1st decade.

Table II-27 displays the data for each indicator for all the alternatives.

Table II-27. Tradeoffs of Economic Benefits and Indicators of Response to Issues

Issues	Max PNV Bench -mark	Units	NC	K	A	J	W	D	L
Economics									
PNV	3.8	$MMM	NA[3]	3.5	3.2	3.1	2.9	2.8	1.6
Cash Flows 1st decade		$MM/Yr	NA	66	62	54	52	42	6
5th decade		$MM/Yr	NA	88	79	86	72	52	6
Noncash Benefits 1st Decade	39	$MM/Yr	39	40	41	41	40	38	41
5th decade		$MM/Yr	NA	71	53	60	62	74	63
Payments to Counties	33	$MM/Yr	39	32	30	27	25	23	8
Changes in Income[1]	NE[2]	$MM/Yr	156	74	53	14	-6	-15	-173
Changes in Jobs[1]	NE[2]	Number	5653	2945	2218	900	204	-167	-5499
Timber									
ASQ[7]	660	MMBF	810	650	608	530	491	476	150
ASQ[7]	113	MMCF	146	117	110	95	87	86	27
Long-Term Sustained Yield	123	MMCF	146	120	114	108	95	94	34
Recreation									
Special Interest Areas	NE[2]	M Acres[4]	1.1	2.8	1.1	22.6	31.1	15.2	3.4
Trail Construction[7]	NE[2]	Miles	0	0	0	4.0	6.0	6.8	4.0
Semiprimitive Nonmotorized		M Acres[4]	75.3	14.4	72.2	89.5	85.8	176.5	102.0
Semiprimitive Motorized		M Acres[4]	23.9	48.3	23.4	31.3	36.0	38.2	66.3
Water									
Low Watershed Risk[5]	NE[2]	% Area	NA	41	47	65	100	78	100
Moderate Watershed Risk[5]	NE[2]	% Area	NA	27	25	17	0	10	0
High Watershed Risk[5]	NE[2]	% Area	NA	29	28	18	0	12	0
Erosion (Debris Slides)[7]	NE[2]	M C.Yds	NA	85.6	80.3	67.0	28.5	33.4	23.9
Wildlife									
Spotted Owl Habitat	59	# Areas[4]	0	59	59	59	59	102	184
Elk Population	NE[2]	M Elk[6]	NA[3]	3.7	4.2	4.5	4.8	5.6	5.6
Deer Population	NE[2]	M Deer[6]	NA[3]	17.8	19.5	23.1	24.9	28.4	26.6
Scenic Quality									
Retention		M Acres[4]	88.6	72.0	77.9	90.5	118.8	142.1	265.1
Partial Retention		M Acres[4]	114.3	147.5	150.1	177.7	171.7	246.7	286.3
Modification		M Acres[4]	4.5	123.6	4.5	206.2	143.0	108.4	4.5
Old Growth									
Acres Remaining After 10 Years		M Acres	494.0	522.4	528.4	534.9	533.4	537.2	578.3
Roadless									
Area Allocated to Roadless	0	M Acres[4]	45.4	25.3	59.8	79.7	92.1	136.9	145.9

[1]Changes represent the total potential change in the 1st decade as compared to historical averages over the life of the current Forest Plan (1977-1985).
[2]NE = Not estimated, benchmarks were not analyzed as fully developed implementable alternatives.
[3]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Forest FORPLAN model. See alternative Considered in Detail, Chapter II for additional information.
[4]Represents lands allocated to meet this objective.
[5]Percent of total Forest area at the end of the 1st decade in this watershed risk category. See Chapter IV, Water for further explanation.
[6]Represents end of 1st decade conditions.
[7]Units are average annual for 1st decade.

Differences and Similarities Among Alternatives

This section describes the major differences and similarities among alternatives in terms of the indicators of responsiveness listed in the previous section. The major factors influencing the economic indicators are described in Response to Issues and Concerns, Chapter II. More details on the outputs and effects of the alternatives can be found in the individual resource sections in Chapter IV. Table II-27 contains data used for these discussions; Tables II-24 through II-26 provide some supplemental information. The alternatives are described in order of decreasing present net value (PNV). The indicators for each issue are discussed sequentially for each alternative. Information for the maximum PNV benchmark is provided only as a reference point. Qualifiers such as low or high used in these discussions are relative to the upper and lower level of each output shown in Table II-27. A more detailed comparison of all the alternatives is found in Appendix B, Section H.

Many response factors show a consistent pattern across the range of alternatives. For example, the level of semiprimitive recreation opportunities are directly correlated with the amount of land suitable for timber harvest and the level of timber harvest in an alternative. This same general pattern of tradeoffs is also seen in the water and old growth issues. For water, increased percentages of the Forest are in the High and Moderate categories as the timber harvest levels increase while the acres of old growth remaining after the 1st decade decrease as the timber harvest level of the alternatives increase. The Roadless, Water and Vegetation sections of Chapter IV describes the relationship of these effects in more detail.

Most of the variation in economic response factors described in Response to Issues and Concerns, Chapter II, can be directly related to the amount of timber harvest in an alternative. This pattern does vary somewhat as a result of the level of recreation oriented benefits provided by an alternative. Alternatives with greater emphasis on recreation have higher levels of recreation benefits. Jobs and personal income variations among alternatives follow the same kinds of patterns as the other economic indicators.

The indicators that could be estimated for the No Change Alternative are displayed in Table II-27, and are described in this section. Many indicators could not be reasonably estimated because alternative NC (No Change) is based on a set of assumptions different than were the other alternatives, and could not be modeled with the current Forest FORPLAN model. Alternatives Considered In Detail, Chapter II describes these differences.

Maximum PNV Benchmark - *PNV: $3.8 Billion* - Opportunity Cost: None (Baseline for Comparison)

The Maximum PNV Benchmark identifies the mix of goods and services with market and assigned values that result in the largest excess of discounted benefits over discounted costs. It meets MRs for resource protection and produces a high level of timber harvest on a nondeclining yield schedule. It is summarized in Table II-27 for comparison purposes.

Alternative NC (No Change) - *PNV: NOT AVAILABLE* - Opportunity Cost: NOT AVAILABLE

Alternative NC would produce the highest level of timber of any alternative (allowable sale quantity of 146 million cubic feet annually). This figure represents the potential yield from the current Forest Land and Timber Management Plan (1977). Although many indicators were not estimated for this alternative, present net value, net cash flows, payments to counties, income, and jobs would all likely be at their highest level with this alternative due to the high level of timber harvest. Conversely, the amount of old growth remaining at the end of the 1st decade would be at the lowest level of any alternative.

Forest land allocations for dispersed recreation, roadless areas, and scenic management areas are those in the current Forest Plan (1977) and are intermediate within the range of alternatives. Since MRs are not a part of this alternative, spotted owl habitat areas would be located only where some other allocation prohibited timber harvesting. Consequently, they are at their lowest level with this alternative. Deer and elk populations were not estimated for this alternative. Although quantitative estimates of watershed impact ratings and erosion were not made for this alternative, the amount of land in the "high" watershed risk category, and the amount of erosion would likely be at their highest level due to the high timber harvest level.

Alternative K (Willamette Forestry Council) - *PNV: $3.5 Billion* - Opportunity Cost: $297 Million as compared to Maximum PNV

With the exception of Alternative NC, Alternative K would produce the highest level of timber of any alternative on a nondeclining yield schedule (117 million cubic feet annually in the 1st decade). This is 29 million cubic feet or 20% less than the harvest level under Alternative NC because of land allocations and application of management prescriptions to meet MRs for water, soil, and wildlife resources. The areas available for spotted owl habitat would increase by 14 for a total of 59 areas in Alternative K. As a result of the lower timber harvest levels, all of the economic indicators are correspondingly lower also. The acres of old growth left at the end of the 1st decade would be 522.4 M acres or 28.4 M acres more than Alternative NC.

The number of Forest acres allocated to dispersed recreation and roadless area retention are similar to Alternative NC, overall. There is, however, an increase in Alternative K of acres managed to meet a modification visual objective. Although watershed risk was not estimated for Alternative NC, based on the rate of harvest it is likely the effects would be similar to Alternative K; 29% of the Forest in the high risk category and 27% of the area at moderate risk of adverse watershed impacts.

Alternative A (No Action) - *PNV: $3.2 Billion* - Opportunity Cost: $319 Million as compared to Alternative K.

Alternative A would continue management of the Forest under the existing Forest Land and Timber Management Plan (1977). However, Forest direction is modified in this Alternative to meet MRs. The timber harvest under Alternative A, 110 million cubic feet, is a decrease of 7 million cubic feet per year from the harvest level under Alternative K. Present net value, payments to counties, and net cash flow drop slightly from the Alternative K level. Income and the number of jobs decrease proportionally with the timber harvest levels. Alternative A would retain 528.4 M acres of old growth at the end of the first decade or 6 M acres more than in Alternative K.

Forest land allocations for dispersed recreation, roadless areas, and scenic management areas (with the exception of Modification in K) are higher in Alternative A as compared to Alternatives K and NC. Spotted owl habitat areas would be protected at the MR level or the same level as Alternative K. Deer and elk populations in Alternative A would show a slight increase over Alternative K. Elk populations increase in Alternative A as compared to Alternative K due to a better balance of cover and forage habitat components and overall habitat quality. The watershed risk levels are similar between Alternatives K and A with over 50% of the Forest at high to moderate risk of adverse watershed effects.

Alternative J (DEIS Preferred) - *PNV: $3.1 Billion* - Opportunity Cost: $124 Million as compared to Alternative A.

Alternative J was formulated to provide relatively high levels of timber on a nondeclining yield basis in combination with production of amenity resources at intermediate levels. Timber harvest would be 95 million cubic feet annually. This level is 15 million cubic feet or 14% less than the first decade annual harvest in Alternative A. The difference in timber harvest between these two alternatives is due to more acres that would be managed for nontimber uses such as dispersed recreation and additional acres of reduced yields such as Retention and Partial Retention scenic objectives. Present net value, net cash flows, payments to counties, personal income, and the number of jobs are less in the first period as compared to Alternative A reflecting the increased emphasis on amenity resources. In Alternative J, 534.9 M acres of old growth or 6.5 M additional acres would remain under Alternative J after 10 years as compared to Alternative A. The amount of existing roadless area allocated to roadless prescriptions is 20 M acres greater in Alternative J than in A. The amount of new trails that would be built in Alternative J is 40 miles over the decade, as compared to no new trail construction in Alternative A.

Deer and elk populations increase slightly in Alternative J reflecting the increased amounts of optimum cover and other habitat enhancements. Spotted owl habitat would be provided at the MR level of 59 areas, unchanged from Alternative A. The lower first decade harvest level in Alternative J results in a 35% of the Forest area in a high or moderate risk category for adverse watershed effects as compared to 55% in the same categories in Alternative A.

Alternative W (FEIS Preferred) - *PNV: $2.9 Billion* - Opportunity Cost: $202 Million as compared to Alternative J.

Alternative W emphasizes the management of both commodity and noncommodity resources on the Forest at levels that would recognize the importance of maintaining intact, functional ecosystems and long term productivity. The timber harvest level in Alternative W would be 87 million cubic feet or 8% less than in Alternative J. Cash flows and payments to counties are only slightly less than in Alternative J, but other economic indicators show significant reductions. Spotted owls would be managed at the MR level of 59 areas, the same as Alternative J.

The amount of the Forest at high to moderate risk of adverse watershed effects decreases to 0%, a significant change from Alternative J. In addition, 12.4 M additional acres would be managed in a roadless condition. The amount of trails to be constructed in the first decade increases by 20 miles over the amount proposed in Alternative J to a total of 60 miles in Alternative W. Overall, the dispersed recreation opportunities in Alternatives J and W are similar. The acres of old growth remaining after 10 years shows a slight reduction (1,500 acres) from Alternative J. Elk and deer populations would increase slightly from Alternative J as a result of increased acres of optimal cover and additional emphasis on habitat management.

Alternative D (Wildlife) - *PNV: $2.8 Billion* - Opportunity Cost: $78 Million as compared to Alternative W.

Alternative D places a high emphasis on the management of wildlife and other amenity resources. This level of management would require reductions in the acres where timber is the primary production goal. The timber sale level under Alternative D is 86 million cubic feet which is similar to Alternative W. First period jobs, personal income, payments to counties, net cash flow, and present net value are

also reduced slightly compared to Alternative W. The old growth remaining at the end of the first decade would be 537.2 M acres or less than a 1% increase over Alternative W.

The increased emphasis on amenity resources would result in more acres allocated for semiprimitive nonmotorized dispersed recreation, scenic zones, roadless areas, and spotted owl habitat areas, as compared to Alternative W. The significant changes between Alternative W and Alternative D are in wildlife and watershed outputs and effects. In Alternative D, the number of designated spotted owl habitat areas is 102 compared to the MR level of 59 in Alternative W. Elk and deer populations would increase by 15 to 20% over Alternative W due to an emphasis on high quality habitat conditions and enhancement projects.

The amount of the Forest in the high to moderate risk category for adverse watershed effects increases from 0% in Alternative W to 22% in Alternative D. This increase is due largely to a harvest level similar to Alternative W on a smaller suitable land base and the decreased emphasis in Alternative D to maintain favorable watershed conditions at the subdrainage level.

Alternative L (Oregon Natural Resources Council) - *PNV: $1.6 Billion* - Opportunity Cost: $1,173 Million as compared to Alternative D.

Alternative L emphasizes the protection of remaining old growth and maintenance of the natural attributes of the Forest. Achievement of these goals would require further reductions in the acres where the primary goal is timber production. The timber harvest level is 27 million cubic feet or 59 million cubic feet less than Alternative D, and is the lowest of all alternatives. All the economic indicators are at their lowest level, reflecting the low timber harvest level. Conversely, Alternative L would retain the greatest amount of old growth at the end of the first decade of all the alternatives with 578.3 M acres or 41.1 M acres more than Alternative D.

Alternative L would maintain all of the current inventory of roadless area in a roadless condition. Approximately 145.9 M acres are allocated to roadless management prescriptions and an additional 169.4 M acres would be recommended for Wilderness designation. The acres that would be maintained in roadless allocations in Alternative L are the most of any alternative. In addition, 184 spotted owl habitat areas, enough to protect the known owl population outside of Wilderness, would be preserved. Deer populations would decrease due to the decrease in forage as a result of lower timber harvest levels. Due to the low level of timber harvest and large amount of land maintained in a natural condition, 0% of the Forest would be in the high or moderate risk category for adverse watershed effects. This is 22% less than the acres similarly rated under Alternative D.

CHAPTER III

AFFECTED ENVIRONMENT

INTRODUCTION

This Chapter describes the environment of the Willamette National Forest that would be influenced by the implementation of any of the proposed Alternatives. The environmental factors discussed are those which are significant and pertinent to issues, concerns, and opportunities. This Chapter, like Chapter IV, is organized by environmental component.

The Chapter begins with general descriptions of the environmental components Climate and Geology, which are followed by descriptions of the other physical, social, and economic components of the Forest. The other environmental components, including those of Water, Vegetation, Wildlife, Timber, and Recreation are described in greater detail to reflect important historic trends, current conditions, and future trends.

The expected changes in the environment that would be generated by implementation of any of the proposed Alternatives are discussed in Chapter IV, Environmental Consequences and summarized in Chapter II, The Alternatives.

GEOLOGY

Knowledge of the geologic characteristics of the Forest provides an understanding of the land's capabilities and limitations for managing the various resources and predicting subsequent effects of management activities. The Oregon Cascade Range of the Forest is divided into two major geologic provinces: the Western Cascade Province and the High Cascade Province (Franklin and Dyrness 1973). (See Figure III-B-1, Geologic Provinces and Bedrock Map).

The geologically older Western Cascades are largely composed of 25 million year old to 45 million year old volcanic and pyroclastic formations, particularly the Little Butte Series and the Sardine Formation. (See Figure III-B-1, Geologic Provinces and Bedrock Map.) The Little Butte Series is dominated by tuffs and breccias that weather relatively rapidly to deep, fine textured soils which can be very unstable. The Sardine Formation, which includes flows of basalt and andesite, weathers slowly and has produced well-drained, coarse, stony soils much less subject to mass movement (Legard and Meyer 1973). A long history of repeated glaciations and active stream erosion has produced the highly dissected topography. Ridgetops are typically about 4,000 to 5,000 feet, with a few peaks nearing 5,700 feet.

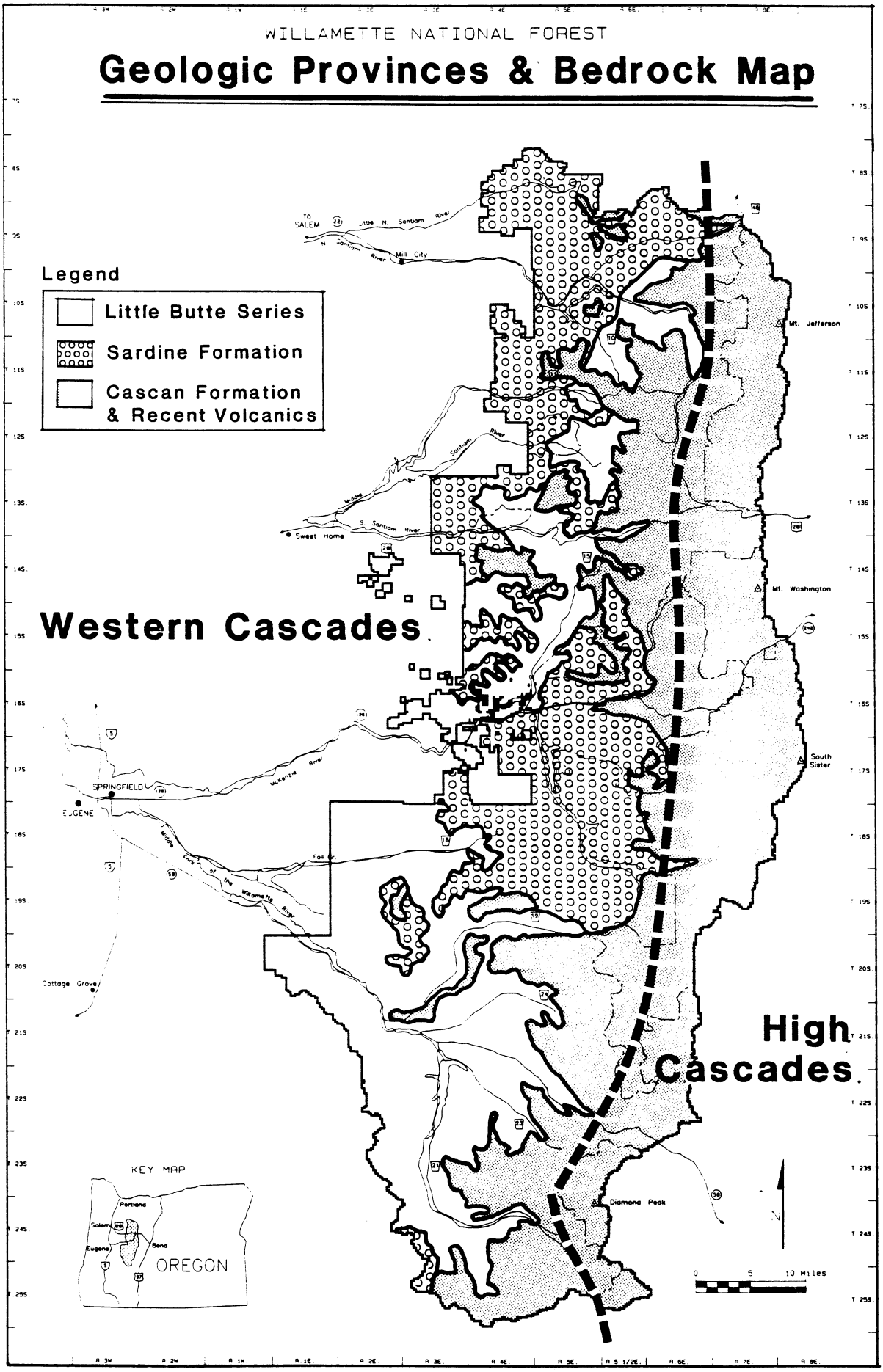
The 13 million-year-old and younger High Cascades occupy nearly one-third of the Cascade Range on this Forest, and are adjacent to the older Western Cascades. These formations have built up from a chain of broad, coalescing shield volcanos (predominantly fluid lava flows), that cover the eroded eastern margin of the Western Cascades. They form gently sloping land, beginning at about 3,500 feet and rising up to a crestal plateau near 5,000 feet. Scattered along the crest are many small volcanic cones along with the well known large composite volcanic peaks which rise another 1500 to 5300 feet above the surrounding terrain. Some of these peaks include Diamond Peak, The Three Sisters, Mt. Washington, and Mt. Jefferson. Soils on the High Cascades are usually immature and often developed in volcanic ejecta.

Glaciers have carved the higher elevation areas repeatedly, even as the mountains were forming. During the retreat of ice in the last glacial period, about 10,000 years ago, the topography was modified to include glacially carved rock headwalls, bowl-shaped cirque basins and their associated lakes, steep U-shaped canyons, and widespread deposits of glacial moraines and outwash materials. Distinct peaks that were highly modified by this glacial action include Mt. Washington and Three Fingered Jack. Present day glacial activity is still occurring on the higher peaks of Mt. Jefferson, The Three Sisters, and Diamond Peak.

Since deglaciation, several factors have acted to change the shape of the land's surface, both in the High and Western Cascades. Pumice from Mt. Mazama (Crater Lake), and deposits of ash, sand, and cinders from local cinder cones buried preexisting soils developed in glacial materials, and recent lava outpouring occurred in the McKenzie Pass and Santiam Junction areas. Large scale, downslope mass movements (landslides) have formed new lakes, altered drainages, and created numerous hummocky, uneven land forms, primarily in the Western Cascades.

Slope stability, (the resistance of natural or artificial slopes to failure by mass wasting), is directly related to geology and topography. Gravity is the most important factor--the steeper the slope, the less stable (Sidle 1984). Water is the next major component (both surface and subsurface)--the more water, the less stable (Brunsden and Prior 1984). Generally, on steep slopes, the thicker the soil the more prone the slope is to failure. This is because thicker soils can become more unstable as they are saturated with water. The rock content of the soil also affects the strength and drainage of soils due to both increased friction and improved water drainage (Huang 1983).

Figure III-B-1.



In the Western Cascades, mass wasting is a particularly important slope-forming process because of the generally steep slopes and areas of low strength soils in this geologic province. Mass wasting is the process of removing rock and soil under the influence of gravity; it includes rock falls, rapid debris slides, slow moving earthflows, and soil creep. Slope failures can involve only a few to several hundred thousands of cubic yards of soil and rock. They can range from small bank failures along drainage courses, to debris chutes where a torrent of water, soil, and rock strips stream channels and banks, to a major slump-earthflow that moves an entire mountainside.

In contrast, mass wasting in the High Cascades Province is relatively minor due to younger, stable volcanic rocks; large earthflows are uncommon. Most of the mass wasting in the High Cascades is confined to debris avalanches along glacially oversteepened canyon walls and in the incised pumice canyons.

Vegetation plays a major role in the complex interactions of slope stability, as well as erosion. It acts to intercept and store significant amounts of precipitation, thereby buffering the effects of storm events. The roots of vegetation physically bind soil particles together; the strength of the roots adds strength to the soil; and the roots may grow to bedrock, forming an effective anchor system. Once precipitation enters the soil it becomes available for the vegetation to remove it through evapotranspiration, which decreases the amount of destabilizing groundwater (Swanston and Swanson 1976).

The relationship between bedrock and soil development directly affects vegetation and vegetative growth. The breakdown of the bedrock provides the growth medium, nutrients, and moisture holding capacity for vegetation. The generally cool, moist climate plays a dominant role in forming the types of soils which will be produced by weathering processes.

The formation of soils is a complex dynamic process which depends upon such things as slope, aspect, climate, elevation, slope position, and rates of weathering, mass wasting and erosion. In general, rocks such as andesites and basalts form shallower, coarse, sandy soils with numerous rock fragments. The more easily weathered ash, tuff, and breccia formations produce deeper, more clay-rich, and finer-grained soils. Some locations, such as recent lava flows and some ridgetops, support little vegetation due to the lack of soil development.

Mineral deposits were formed as a result of a variety of geologic processes including physical and chemical decomposition of rocks at the earth's surface; sedimentation, which is the separation, transportation, and deposition of particles broken down from rocks (important in the formation of placer gold); and hydrothermal processes of alteration and/or mineralization, (important in the formation of lode deposits), where metallic elements such as gold, silver, copper, lead, and zinc occur as or mixed with complex compounds distributed within solid rock. Fracture fillings, commonly called veins, within the hydrothermal fluid channels have been sources of gold and silver in the past. Mineralization of the Western Cascades is of limited extent. The patented claims of the North Santiam District, located in the Little North Santiam drainage, produced small amounts of gold and silver and minor amounts of copper, lead, and zinc. The other mining districts (Blue River, Quartzville, and Fall Creek) produced minor amounts of gold and silver (Weissenborn 1969). (See Chapter III, Minerals and Energy.)

The geological processes which influence the Forest affect almost all management decisions in some way. The increasing demand for recreation, cost of road building, accessibility of timber sale areas for cost-effective logging, the control of fires, the need for clean water, as well as other management activities all require a clear understanding of the geologic environment.

For example, the topography of the region affects the complexity of logging operations. Increased cost in felling, bucking, and yarding are directly related to such things as the number of landings available,

the distance from the landing to the unit boundary, slope steepness and suspension requirements. Cost in road construction and maintenance are directly related to the distance required to haul aggregate to the site, excavation in steep or rocky slopes, difficulty of stream crossings, and necessity for structures. Rock for road surfacing and maintenance is considered a nonrenewable resource. Aggregate costs often influence road standards and operating seasons.

Road construction and reconstruction have both direct and indirect effects on slope stability. Road construction causes permanent alteration of the soil mantle/bedrock/water interactions. Studies by Sidle, Pearce, and O'Loughlin (1984) indicate that road construction on any hillslope will inevitably decrease the site stability because of a number of factors. Cuts and fills on side slopes effectively steepen the slopes and decrease the stability. The slopes may be overloaded by embankment fill. Support of the hillside is lost by the cut-slope excavation. Surface and subsurface water drainage paths are altered and concentrated. The road surface is essentially impermeable; thus, during storms more surface water flow occurs. Culverts which become restricted by sediment and debris may be unable to handle runoff, resulting in road failures.

Roads not only affect the stability of the cut and fill slopes, but also the slopes below the road. Culverts sometimes concentrate water where none previously flowed. The drainage water may be routed into potential of inactive earthflows downslope of the road and decrease their stability. Disposal of drainage runoff into slope depressions and other wet areas, especially on steeper side slopes, can also initiate shallow rapid failures on debris chutes. The stabilizing effects of vegetation are removed from the road alignment. The relative importance of any of these influences on slope failure depends on site conditions, construction design, and construction techniques. For example, sidecast road construction on the older roads in the Forest continues to be a major slope stability problem by causing debris chutes.

Recreation is also greatly influenced by geology and topography. Areas like Hoodoo and Willamette Pass ski resorts rely on the slopes of the High Cascades for all types of snow skiing. Rock formations like the rock spires of the Menagerie Wilderness, and the peaks of Mt. Jefferson, North Sister, and Mt. Washington provide technical climbing opportunities. Dee Wright Observatory on McKenzie Pass provides an inspiring view of the Cascade Range and recent lava flows. Unique formations such as Tumblebug Gorge and Phantom Natural Bridge reflect nature's sculpturing, while rock cuts in the river channels can provide whitewater recreation.

The sections on Soil and Minerals and Energy also contain information regarding the geological component of the environment.

CLIMATE

Climate is important in the development of the Forest environment and, as a consequence, Forest management. Many aspects of the Forest are influenced by the weather. The winter and early spring seasons supply snow for downhill and cross-country skiing, snowshoeing, and off-road vehicle activity. Melting snow brings the water for municipal use and hydro-electric generation, as well as white water recreation and fish migration. Often, when fog persists in the Willamette Valley during the winter months, the Cascade Mountains are sunny. These sunny periods are an invitation to escape from the fog, go sightseeing or enjoy snow related activities. In the dry summer season, many people again come to the Forest from the valley to seek relief from the heat.

Historic Trends/Current Situation

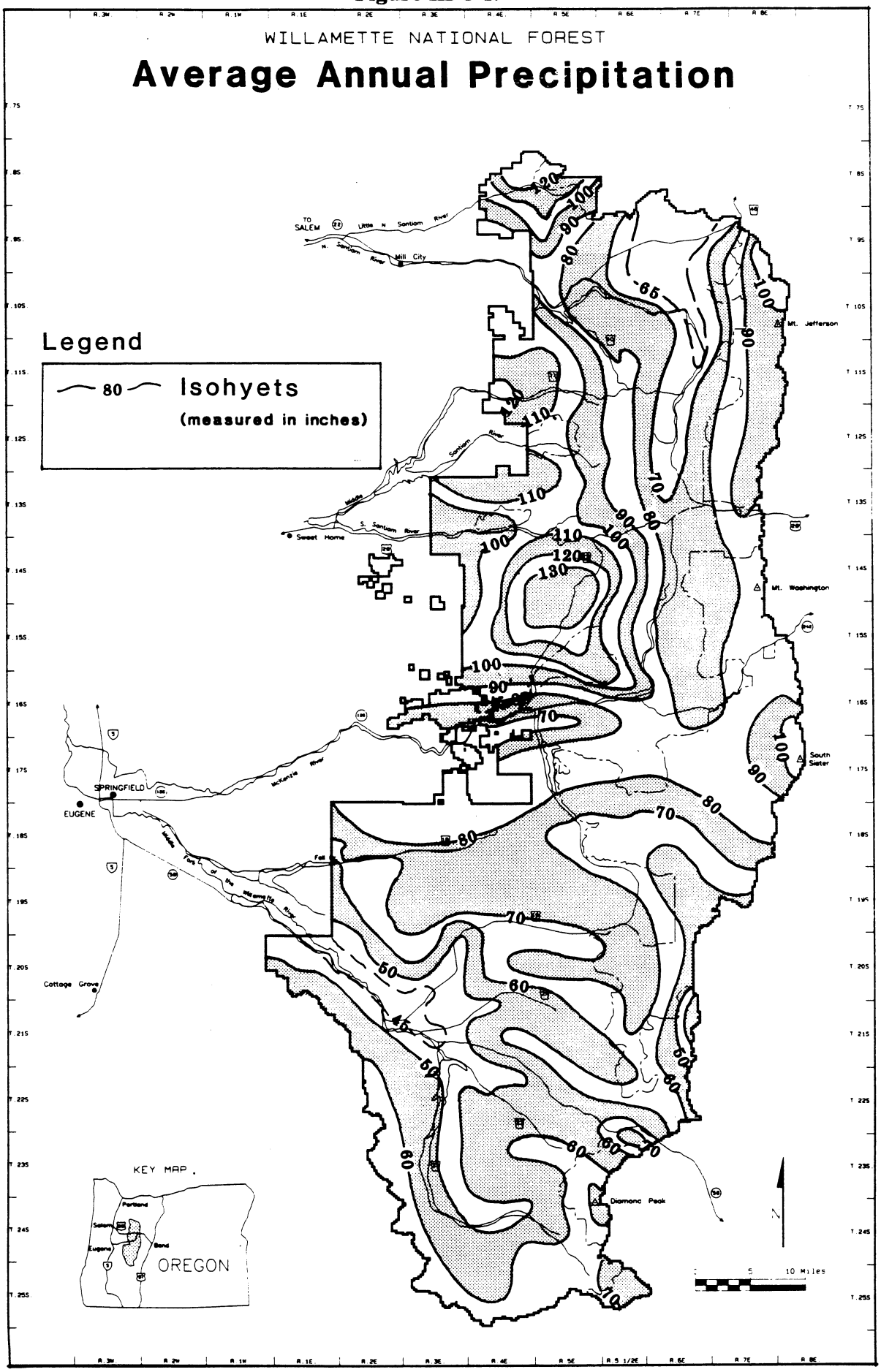
The climate of the Forest is referred to as Pacific Maritime. It is influenced by several factors including the position and intensity of upper level wind currents, the high and low pressure systems over the North Pacific Ocean, and variations in topography. In the summer, high pressure brings fair mild weather to the Forest. As winter sets in, the high pressure moves to the south, allowing the storms to move across the Forest. These frontal systems bring mild rainy conditions to the valleys and lower elevations of the Forest and heavy snows generally above 4,000 feet elevation (Sterns and Gilbert 1960).

The heaviest precipitation lasts for 3 months starting in December and accounts for 40 to 60 % of the yearly total. Mean average temperatures range from 30 to 40 degrees in January and average in the 60 degree range in August (Legard and Meyer 1973). The Forest receives the least amount of precipitation between June and October, when temperatures are highest. Thunderstorms occur most often during these months. Refer to Figure III-C-1 for average precipitation over the Forest.

This moisture has been one of the primary climatic factors affecting vegetative growth. The Forest has relatively dry cool summers and mild wet winters which are particularly favorable to evergreen conifers (Waring and Franklin 1977). Native conifers are able to carry on photosynthesis through the winter months while hardwoods are dormant. These conditions have created a magnificent conifer forest on the Forest with trees that grow to be some of the largest and longest living plants on earth. These plant formations are known for creating some of the earth's largest accumulations of biomass.

The vegetative patterns of the Forest are strongly influenced by both climatic and topographic conditions. As the elevation increases, the climate becomes more severe. As a result species composition and size decrease in the higher elevation. Another important factor influencing vegetation is that the south half of the Forest is considerably drier than the north half (Hemstrom et al. 1982). (See figures and discussion in Chapter III, Vegetation.) Thorough accounts of vegetation zones and communities on the Forest are in publications by Franklin and Dyrness (1973), Franklin (1979), Hemstrom et al. (1982, 1985).

Figure III-C-1.



Site specific microclimatic conditions are an important aspect of the Forest environment and often directly affect plant and animal habitat. Although meadows, rocky areas and clearcuts are exposed to the weather, riparian zones along creeks and lakes provide shade, lower temperatures and increased humidity. Changes in microclimate are also caused by activities such as timber harvest and road construction. For example, the removal of a stand of trees by clearcutting can cause local wind patterns to shift, lower humidity, and increased solar radiation. Chapter III, Timber and Appendix F both contain discussions of silvicultural treatments used on the Forest. For additional information on wildlife habitat see Chapters III and IV, Wildlife. Climate has played an important role in developing the forest soils. The weathering, decomposition, sedimentation, and overall mineralization caused by ice, snow, rain, wind, sun, cold, and heat are directly related to the breakdown of the bedrock to form soil. Some soils become very unstable with the effect of water saturation and gravity. These soil conditions are discussed in more detail in Chapter III, Soil and in Chapter IV.

When conditions are warm and dry, periodic thunder and lightning storms can result in the ignition of wildfires, but strong east winds often present more critical fire danger. During the summer and fall seasons, these dry, warm winds may be sustained between 30 to 40 miles per hour with stronger gusts over the higher ridges. During these periods, small smoldering embers can quickly ignite large fires requiring major fire suppression efforts, and as a consequence, industrial operations are restricted and prescribed burning activities are curtailed. In extreme cases the Forest is closed to all uses until rain or humidity lowers the danger.

The weather patterns also affect slash burning activity and the subsequent effects of smoke on air quality. Maritime winds provide good mixing and dispersion of smoke into the upper atmosphere and away from smoke sensitive areas in the populated valley bottoms. It is common to have completely different atmospheric conditions in the western valleys as compared to the distant ridge tops. See Chapter III, Air for additional information.

Weather conditions also influence the construction and use of Forest roads. Because of the wet conditions in the winter and spring, roads need to be constructed to a higher standard to alleviate drainage problems. Some roads are not used at all in the winter because of deep snow, mud slides, and fallen trees. See Chapter III, Roads.

Future Trends

An emerging issue that is gaining attention worldwide is global warming. Concern has been increasing as the following data has been gathered by various scientific organizations:

1. The 1980's decade was the warmest in recorded history.

2. The carbon dioxide level in the atmosphere has increased from 315 ppm to 350 ppm since 1958.

3. The rate of increase in carbon dioxide is faster than at any time during the last 100,000 years.

Climatic change and variability along with stresses from existing and new atmospheric pollutants have undetermined impact on the forest and it's ecosystems. Existing historical data are inadequate for predicting future forest responses.

To deal with the scientific uncertainty about the likelihood and signicance of potential climatic changes, Congress is working on a variety of bills (Global Climate Change Prevention Act - S.1610, and the Urban and Community Forestry Act - H.R. 2144) to stimulate research and develop strategies for adapting to and mitigating the impacts of climate change. In addition, the U.S. has joined 70 other

Nations in a "Declaration on Global Climate Change" which identifies improved forest management as one of eight major areas for international funding.

A 1988 USDA Forest Service report, "Forest Health and Productivity in a Changing Atmospheric Environment" identified three broad questions on the effects of physical and chemical climate changes on forest, range and related ecosystems, for which research is needed:

1. What processes in forested ecosystems are sensitive to physical and chemical changes in the atmosphere?

2. How will future physical and chemical climate change influence the structure, function, and productivity of forest and range ecosystems?

3. What are the implications for forest management, and how must forest management activities be altered to sustain forest health and productivity?

A recent study predicted the average global temperature could increase by 1.5 to 5.0 degrees Centigrade over the next 50-100 years. If global warming results in temperature increases of this magnitude, the following changes would be possible in the West Cascades:

1. Vegetation bands could shift upward by as much as 1,000 feet in elevation. The Forest would resemble the present forests of northern California with more Grand fir, Sugar Pine and Ponderosa Pine, and less western hemlock. At lower elevations near the valley floor, the vegetation would likely change to chaparral and oak woodland.

2. Although total annual rainfall would probably be about the same, it would be concentrated in a few severe storms. Summers would be hotter and drier with lower streamflows and warmer water temperatures. The risk of wildfires would be much higher. Trees would be under more stress and increasingly susceptible to a variety of pathogens.

3. Overall productivity of the forest would probably decline, although there might be an increase at some of the mid to high elevations. Some of the highest mountain hemlock types may change to nonforest shrubs and meadows.

There are many unanswered questions concerning the global warming issue. Data is scarce and sometimes conflicting. However, during implementation of the Forest Plan the following strategies should be considered in preparing for possible changes:

1. Emphasize a diversity of species in plantations including hardwoods.

2. Maintain or enhance this mix through the precommercial and commercial thinning entries.

3. Start selecting some trees in the genetic program for their drought resistance instead of height growth.

4. Increased protection of riparian areas to maintain channel stability and cool water temperatures.

The Forest Monitoring Plan will cover reforestation success/failure by habitat types and be able to track changes in vegetation that might be indicators of a climatic warming trend.

SOIL

Soil is a fundamental component of the environment. It is the growing medium for most plants. Soil absorbs and stores water, releasing it slowly over time; it supplies nutrients for vegetation which in turn supplies habitat for wildlife and resources that people use and enjoy. All renewable surface resources of the National Forest are dependent upon soil. Soil is considered a nonrenewable resource because of the length of time required for its formation.

Historic Trends

Soils of the Forest are diverse, reflecting the influence of climate, time, vegetation, parent material, and topography. Parent material of the Forest's soil is almost entirely of volcanic origin and can be divided into two broad classes: hard volcanic rocks, such as basalts, andesites, and intrusions of various kinds; and soft volcanic rocks, such as breccias, tuffs, and volcanic ejecta. Soils with parent materials consisting of hard volcanic rocks may develop at a rate of approximately one inch per thousand years, while soils with parent materials consisting of soft volcanic rocks may develop at much faster rates. Soils can also form on materials derived from other geologic materials and include deposits of glacial outwash and till, alluvium, loess, colluvium and sediments.

Geologically recent volcanic ejecta (pumice, ash, sand, and cinders) have had a major influence on soil formation in the High Cascades region of the Forest. These rock types are generally found at elevations in excess of 4,000 feet, but in the southeastern portion of the Forest, this material occurs at about 3,000 feet and higher. Because of the short, dry, growing season and high snow pack, vegetative growth and microbial activity are restricted. This makes soil formation much slower than in the more temperate lower elevations. These soils are generally not as well developed, or as fertile as those occurring in the Western Cascades. Refer to Section B, Geology, in this chapter for additional discussion of the bedrock and the soil and mineral forming processes.

An inventory of the soils of the Forest was completed and published by Legard and Meyer in 1973. It is entitled "*Soil Resource Inventory (SRI) of the Willamette National Forest.*" This inventory grouped areas of similar soil, parent material, land form, and vegetation into units called landtypes. These landtypes were the basis for the interpretations provided in the report. The inventory recognized 159 mapping units consisting of landtypes, miscellaneous landtypes, and complexes. The objective of the SRI is to provide soils information in a useful form to land managers as an aid to multiple-use management.

Current Situation

Forest management activities directly affect soil productivity in both the short- and long-term. The concept of productivity includes both the ability to grow vegetation as well as the maintenance of slope stability. The major concerns include the increased risk of soil movement from roading and clearcut timber harvest, reduced growth potential from compaction, nutrient loss from fire, and reduced productivity from loss of large woody material.

Soil productivity varies widely due to varying characteristics such as soil depth, available moisture holding capacity, nutrient status, and site characteristics including elevation, slope, and aspect. The most productive soils for producing wood fiber are found in valley bottoms, toeslopes, and benches.

These include SRI landtypes 14, 15, 22, 23, 25, 35, and their complexes which total approximately 14% of the Forest (Legard and Meyer 1973).

An important component of soil productivity is organic matter content, and related nitrogen availability. Soil organic matter directly affects both water and nutrient holding capacity as well as soil tilth. Organic matter holds many times its weight in water and has a high cation exchange capacity that increases the soil's ability to hold plant nutrients. Organic matter in the form of leaves, needles, and twigs is itself a supply of plant food as it decomposes and releases nutrients, especially in the higher elevation soils. Large woody material (whole downed, rotting trees) supports the life cycle of symbiotic soil fungi which attach to conifer roots, and greatly increase the trees ability to take up nutrients and water. Duff and litter on the soil's surface also act as a mulch and reduces soil erosion due to rainfall impact. Fine rootmats in the surface soil bind the soil together, reducing downslope soil creep and washing. Some Forest soils, for example, have accumulated very little organic matter and are considered sensitive to any organic matter removal by management. These soils generally occur in the upper elevations where the colder climate and short growing season does not generate large amounts of annual vegetative growth.

Timber management can affect organic matter and nitrogen content in several major ways. Logging or wood removal and fuels treatment or prescribed burning can both directly remove organic matter as well as change erosion rates. Surface erosion process are active both during summer drought periods as dry ravel and during winter rainfall events. In timber harvest units, surface erosion rates may exceed natural rates depending on such factors as degree of disturbance, severity of burn, and steepness of the slope. Vegetative regrowth usually forms a protective barrier and binder equal to the original stand within ten years after disturbance (Swanson and Grant 1982). Nitrogen fertilizer, on the other hand, may be applied to soil to increase soil productivity. This results in more and higher quality forage, quicker vegetation responses for shading riparian zones, and more wood fiber in a shorter period of time.

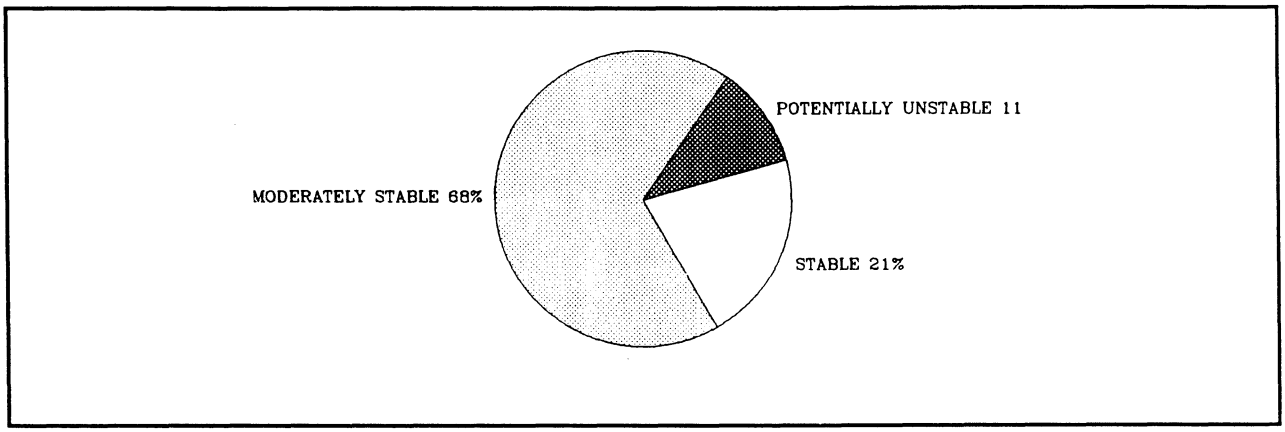
Slope stability is also a fundamental component of soil productivity. Soil stability classes were established for the Forest based on the "Expected Mass Movement as a Result of Man's Activity" rating (Legard and Meyer 1973). Slope stability is also discussed in the Geology section.

Figure III-D-1 shows the relationship of three stability classes to the available land suited for timber production. The three stability classes used in the planning process have been defined as follows:

> Stable--Gentle to moderate slopes (40 to 60%) with hard rocks, and rock with or soil. About 21% of the tenatively suitable forested land is made up of this class.
>
> Moderately Stable--Steep slopes (60+ %) with hard rocks and moderate slopes with soft rocks. About 68% of the tenatively suitable forested land is made up of this class.
>
> Potentially Unstable--Steep slopes and soft rocks. About 11% of the tentatively suitable forested land is made up of this class.

Mass wasting by either debris avalanches or of slump-earth flows are dominate mechanisms for downslope movement of soil. The principal impact of soil movement is on the aquatic environment, but soil productivity is also reduced in the affected area. The delivery of sediment to the aquatic environment is more efficient with mass wasting type processes than it is in surface erosion. This is described in greater detail in the Water section.

Figure III-D-1. Soil Stability Classes for Timber Harvest



Mass wasting can occur on distinctly different land types within the Forest. Deep, plastic, clay soil types formed from tuffs and breccias tend to be dominated by slump- earth flow movement. These types of failures are deepseated by nature and occur predominately on SRI landtypes 25, 33, 35 and their complexes that cover 11% of the Forest. Shallow noncohesive soils over hard bedrock are prone to debris torrents and debris avalanches. These are made up of SRI landtypes 3, 8, 9, 21, 31, 61, 94 and their complexes that comprise about 35% of the Forest. Cost of road construction and maintenance increases within these areas. In some cases, road construction across these landtypes has been prohibited because the risk of resource damage was higher than the benefit. Sidecast of excess excavated material on steep sideslopes (greater than 55-60%) is not considered an option in future road building proposals for any land type, because of the high risk of landsliding.

Future Trends

The demand for the soil resource is that it remain productive. Accelerated surface soil erosion, mass wasting (slope stability), and excessive compaction will continue to be management concerns.

Both total erosion and the delivery of sediment to streams is expected to decrease in the future due to changes in road construction practices and because over 80% of the Forest transportation system is currently in place, although these processes will continue to occur Forest-wide as a result of natural storm events. As previously undisturbed areas of the Forest are entered for timber harvest activities, the slope stability of potentially unstable land flows may be disturbed increasing the potential for mass movement. In localized areas, surges of sediment may exceed average drainage trends. As a consequence, it will become increasingly important to identify, locate, and analyze active and potential slump and debris avalanche areas prior to management activities, and to incorporate site specific analysis in project design and implementation.

WATER

Water draining from the Forest is of high quality and provides many benefits. The Forest furnishes water for municipal and domestic uses, fish hatcheries, electrical power generation, and recreation. Water provides fish and wildlife habitat, and supports one of the most productive vegetative environments in the world. The two basic forms of water on the Forest are surface water, (streams, rivers, lakes, and reservoirs) and subsurface, or groundwater.

The principal issues for water resources on the Forest involve the yield, quality, and use of surface waters, mainly in streams and rivers. Concerns for water quality received the second highest rating in the issue development survey.

Historic Trends

To assess the current condition of Forest water resources, particularly streams, an understanding of the management history is needed. An understanding of the physical and climatic setting is also necessary, particularly as it relates to flood history and potential future, flood occurrence. The infrequent catastrophic floods which occur on the Forest have had considerable influence on current management philosophy and practices.

Before Forest management activities began, natural processes were the sole means of change in the landscape. Catastrophic flood events, recurring at varying intervals, were the dominant forces to change of Forest water resources. In the Cascades, major flood events are caused by storms which deliver large quantities of precipitation in a short time. Rapid snowmelt caused by warm rain also contributes to flood events.

Major flood events occurred in 1861 and 1890 which caused extensive damage in Eugene, Springfield, Salem, and Portland areas. During the 1940s and 1950s, several flood events occurred which also resulted in extensive property loss in the Willamette Valley. The US Army Corps of Engineers conducted extensive flood control studies in the Willamette basin during the 1950s. Subsequently flood control reservoirs were constructed on all the major Willamette River tributaries.

Flood control reservoirs located on the Forest, or controlling the off forest flow of streams are: Detroit (North Santiam River); Foster and Green Peter (South and Middle Santiam River); Blue River and Cougar (McKenzie River); and Hills Creek, Lookout Point and Fall Creek (Middle Fork Willamette River). A reregulating dam on the South Fork of the McKenzie below Cougar Reservoir has been authorized but not funded by Congress. This dam would be called the Strube Dam.

During the winter of 1964/65, two very damaging storm events occurred. The December 1964 event was a 100-year flood (one that occurs on average once in 100 years) on all Willamette basin streams. The January 1965 event was approximately a 50-year flood. Other major flood events occurred in 1956, 1957, 1971, 1974, 1978, 1981, and 1986.

Major damage from the 1964 storms was to roads and bridges totalling approximately $12,000,000 within National Forests in Oregon. Damages to fisheries were extensive, though not calculated in terms of dollar value. Of 725 soil and debris slides reported from Oregon National Forests, 78% were associated with roads or logged areas (54 and 24%, respectively). These proportions are consistent with those found on the Forest, which received the most extensive damage of all the National Forests affected by the storms (Region-6 Storm Damage Report 1966). Although infrequent catastrophic events are the dominant source of change to Forest water resources, management related alterations of a

watershed increase the ability of a flood to cause damage to streams, fish habitat, and improvements (Lyons 1981; Grant 1984). The next 100-year flood which strikes the Forest will have potential to cause more extensive damage than the 1964/65 events, because of the twofold increase in total road miles, as well as increase in acreage harvested. This assertion is evidenced by the $1.3 million in damage to roads, bridges, and culverts caused by a 10-year flood event which occurred in late February 1986 (*Willamette National Forest Storm Damage Report, 1986*). A 10-year flood event occurs on average, once in 10 years and produces about half of the water volume of a 100-year event.

In the late 1940s and early 1950s, extensive timber harvest began on the Forest. Initial road construction practices called for side-cast wasting; material in excess of that needed for construction of the road bed was pushed over the side. The result was an accumulation of loosely arranged material and overweighting of the slope below the road. During the major events of 1964-1965, many of these areas slid, causing sedimentation of adjacent streams.

In the late 1960s and early 1970s the hauling of waste material to stable sites began to be required. This practice, along with stabilization of existing road fills, has greatly reduced the volume of sediment entering streamcourses.

Timber harvest practices have followed a similar history. Initially, little or no suspension of logs was required as they were yarded across the slope or through small, unstable Class III and IV streams. The result was sedimentation of streams and an increase in landsliding in small streams within harvest units. Beginning in the 1970's, more sophisticated logging practices have greatly reduced sedimentation resulting from timber harvest. Partial or full suspension of yarded logs, vegetation left to stabilize soils, and improved tree falling techniques have effected a decrease in sedimentation.

Management practices in riparian or streamside areas have undergone a similar transition. Initial practices did not recognize the need for preservation of stream shading vegetation on fish bearing streams, nor that shade removal on nonfish bearing perennial streams could have a cumulative impact to downstream fisheries due to the increase in water temperature. Several streams had daily peak summer temperatures warmed to the low to mid-70 degrees Fahrenheit (Total Resource Inventory, Aquatic Subsystem files).

Beginning in the mid-1970s, analysis of shade requirements, and leaving of necessary shading vegetation was initiated. As a result of these efforts, as well as shade recovery in older harvest units, recent research and Forest monitoring have documented an apparent drop in peak summer water temperatures in Salmon, Fall and Winberry Creeks (Beschta and Taylor 1986) (Total Resource Inventory, Aquatic Subsystem Files).

Another practice common in the 1960s through mid-1970s was the removal of natural woody debris, or downed logs, from streams in and adjacent to harvest units. This practice was initiated because of extreme amounts of damage to culverts and bridges caused by debris carried by the 1964/65 floods (Part II, Region-6 Flood Damage Report, 1966). As a result, the standard design capacity for bridges and culverts was increased.

The actual function of wood in streams was poorly understood at that time. Research now shows large woody debris is the critical link in fish populations and habitat quality, and that it has a similarly critical role in maintaining channel stability. Downed logs have important functions in dissipating stream energy, storing and routing sediment, and so provide for virtually all of the habitat requirements of anadromous and resident fish (Harmon et al. 1986).

Beginning in the early 1980s, the removal of woody debris was curtailed, except where necessary to protect an existing improvement. It is now a standard management practice to plan for the maintenance of the existing woody debris and to provide a source for future deposits of wood into the streams.

In the past, before management activities began, the Forest's watersheds had the capability of producing consistent flow patterns and valuable fish habitat. As management intensified, it was noted that peak streamflow appeared to be increasing in major rivers draining the Forest (Christner and Harr 1981).

Increased peak streamflow may destabilize a stream by altering the balance under which the stream developed, causing an increase in sediment production and a decrease in bed and bank stability. At any given time, stream conditions are a function of both the volume of sediment and water passing through it and the relative ability of its bed and banks to withstand the scouring effect of the water. As flow volume increases a stream's ability to carry sediment increases, as do bed and bank erosion (Heede 1980).

Peak streamflow increases were suspected to be caused by the rapid melt of snow accumulating in harvest units located between 1,500 and 4,000 feet in elevation. It was found that harvest openings collected a deeper snowpack than surrounding timbered areas, and that the snow melted more rapidly, particularly in the presence of wind and warm rain (Christner and Harr 1983).

In the early 1980s, as a result of these interrelationships, the Forest established a management consideration that watersheds should be maintained at approximately 75% hydrologic maturity, to minimize potential increases in peak streamflow and landsliding (Christner 1982).

Undisturbed areas of the Forest generally have soil surfaces which allow water to penetrate at a rapid rate even during lengthy storms of medium intensities. Under these conditions, overland water flow rarely occurs. Subsurface water typically surfaces in springs, streams and lakes and accounts for nearly all streamflow on the Forest. A portion of the subsurface flow penetrates deeper and recharges porous underground strata called aquifers. The distribution and characteristics of ground water occurring in aquifers are complex.

It is hypothesized that the High Cascades mountains in addition to river confluences, and alluvial deposition areas, contribute to recharge areas for aquifers in the Willamette Valley and portions of eastern Oregon immediately adjacent to the Cascades. A large portion of the precipitation which occurs during the winter months above 4,000 feet in elevation in the High Cascades falls as snow. The recent volcanic area of the High Cascades (see Figure III-B-1, Geologic Provinces and Bedrock Map) is largely composed of porous rock formations. As the snowpack melts during the spring and summer months, it significantly influences the seasonal volume of runoff and groundwater recharge.

Current Conditions

The Forest drains the western front of the Cascade Mountains, from southeast of Eugene to east of Salem. All of the river basins on the Forest are tributary to the Willamette River, which enters the Columbia River at Portland. Total water yield from the Forest is 8.9 million acre feet per year (Hubbard et al. 1983). Major river drainages on the Forest are the North and South Santiam, McKenzie, and Middle Fork Willamette. Figure III-E-1 depicts the major watersheds on the Forest.

The Forest contains approximately 9,300 miles of streams. Streams on the Forest have been classified according to use and/or potential use (FSM 2520). Class I streams (426 miles) are comprised of water used for municipal or domestic purposes, or contain large numbers of fish, both anadromous and resident.

Class II streams (940 miles) either contain or have the potential to contain resident sport fish. Class III streams (1,295 miles) are perennial, non-fishbearing streams and Class IV streams (6,621 miles) flow intermittently. Figure III-E-2 depicts the normal classification hierarchy of streams in a "typical" watershed.

The mileage of streams by class, major watershed, and Ranger District is shown in Figure III-E-3. Streams from the Forest produce the high quality water and physical environment necessary for anadromous and resident fish spawning and rearing. See Figure III-I-2 for the amount and type of fish habitat by major watershed (Fish Section, this Chapter).

There are over 390 natural lakes on the Forest, accounting for more than 11,233 acres (17.6 square miles) of surface area. Most of the natural lakes are located in the High Cascades, above 4,500-foot elevation; 74% (289) of the lakes are within Wilderness. The other 26% (101) are in other land use designations. The lakes on the Forest vary widely in size and productivity, but trout are found in the majority of the lakes over 2 acres in size and 8 to 12 feet in depth (Stewart and Skeesick 1982). There are at least 375 fish-bearing lakes between 2 and 50 acres in size, with 15 lakes ranging in size from 50 to 360 acres (Stewart and Skeesick 1982). The surface stream network in the High Cascades where the majority of the lakes are located, is poorly developed. As a result, few of the lakes have spawning habitat available, and only 10% have naturally reproducing fish populations (Stewart and Skeesick 1982).

The gem of the lake system on the Forest is Waldo Lake, the second largest (6,420 acres) and second deepest (maximum 420 feet) natural, nonalkali lake in Oregon. Waldo Lake is truly a world-class water body, being one of the clearest and cleanest lakes in the world (Lider et al. 1980). The Waldo Lake Wilderness, Waldo Lake Recreation Area, and Torrey-Charlton Natural Area are management units of the Forest contributing to the protection of the water quality and aesthetic setting of the lake, while promoting recreation uses.

Water Use

Several categories of use exist for water originating from the Forest. The first category includes off forest domestic and municipal water supply. Other off forest uses are irrigation, recreation, power generation, and fish hatcheries. Manipulation of water releases from the five largest reservoirs on the Forest assures acceptable water quantity and quality during the summer months in the Willamette River at Albany, Salem, and Portland. On Forest use includes fish and wildlife habitat, recreation, and fish hatcheries. Anadromous fish spawned on the Forest contribute to the Columbia River sport and gillnet fisheries. Figure III-E-4 lists current water use in the major Forest watersheds by Ranger District.

The Forest has 37 surface sources for drinking water supply, including 14 municipalities, 7 unincorporated or private suppliers and 13 campgrounds. As displayed in Figure III-E-5, the Forest is the principal source and is defined as greater than 50% of the watershed area above the point of withdrawal for municipal use is on the Forest. This assumes that all of the land in the watershed contributes equally to water yield as measured at the withdrawal site of drinking water for approximately 204,000 people in the Willamette Valley and surrounding communities. The Forest supplies 82% and 72%, respectively, of the water used by Eugene and Salem, which have a combined population of 185,000. The cities of Albany and Lebanon (combined population 35,000) receive approximately 34% of their water from Forest land.

As defined by the USDA Forest Service (FSM 2543, R-6), the Forest potentially has 21 municipal watersheds. For a watershed on Forest to be classified as a municipal watershed, Forest Service management activity must have the potential for having a significant effect upon the quality of water

at the point of withdrawal. In addition, through the point of withdrawal the watershed must meet one or more of the following criteria:

- Serve at least 25 individuals at least 60 days per year.
- Provide at least 15 service connections.

For this purpose, municipal applies to unincorporated or private utilities, as well as incorporated municipalities.

The Forest has no formal municipal watershed agreements, and consequently manages forested watersheds for multiple use purposes and values. None of the watersheds are afforded specific or special management prescriptions for the express purpose of protecting domestic water supplies over and above standard management practices to ensure water quality.

The quality of water delivered to the withdrawal facilities for the watersheds with 100% Forest land has been of sufficient quality that the Forest has not been approached to develop formal municipal watershed agreements. The quality of water delivered to the largest cities; Eugene, Salem, Albany, Lebanon, and Sweet Home depends not only on Forest Service practices, but also several private landowners, the Bureau of Land Management, Oregon State Department of Forestry, and the US Army Corps of Engineers reservoir management programs (see Figure III-E-5).

Currently there are four hydroelectric facilities on the Forest, operated by the US Army Corps of Engineers (COE). These are Lookout Point, Hills Creek, Cougar, and Detroit Dams. Fall Creek and Blue River Dams are being studied for retrofitting with hydroelectric generating capacity. Eugene Water and Electric Board (EWEB) operates a hydroelectric generating system in the upper McKenzie River basin, at Carmen, Smith, and Trailbridge Dams. The Forest supplies greater than 75% of the water used to operate these seven facilities. The combined capacity of the seven facilities generates sufficient power to meet the needs of thousands of households each year.

Passage of the Public Utility Regulatory Policies Act in 1978 encouraged the private development of small power projects. The act requires electric utilities to interconnect with and purchase power from these small sites. Currently one project is on line at Falls Creek on the Sweet Home Ranger District generating 4 megawatts of power. Two additional public projects are operating and three other sites on the Forest are at various stages of study or application for licensing from the Federal Energy Regulatory Commission (FERC). If all of these sites were to be completed, they would produce an estimated 132 megawatts of power.

Figure III-E-1.

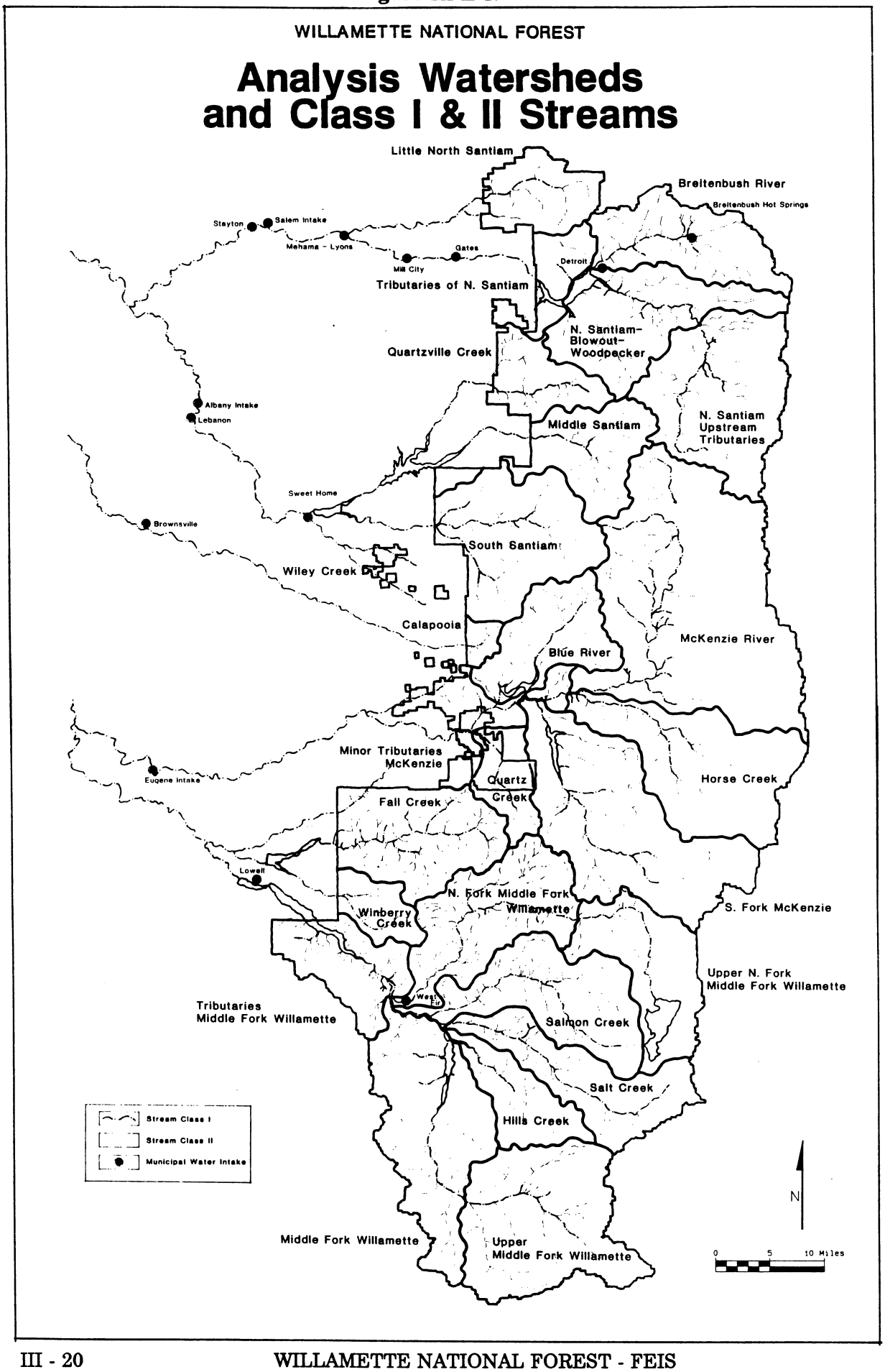
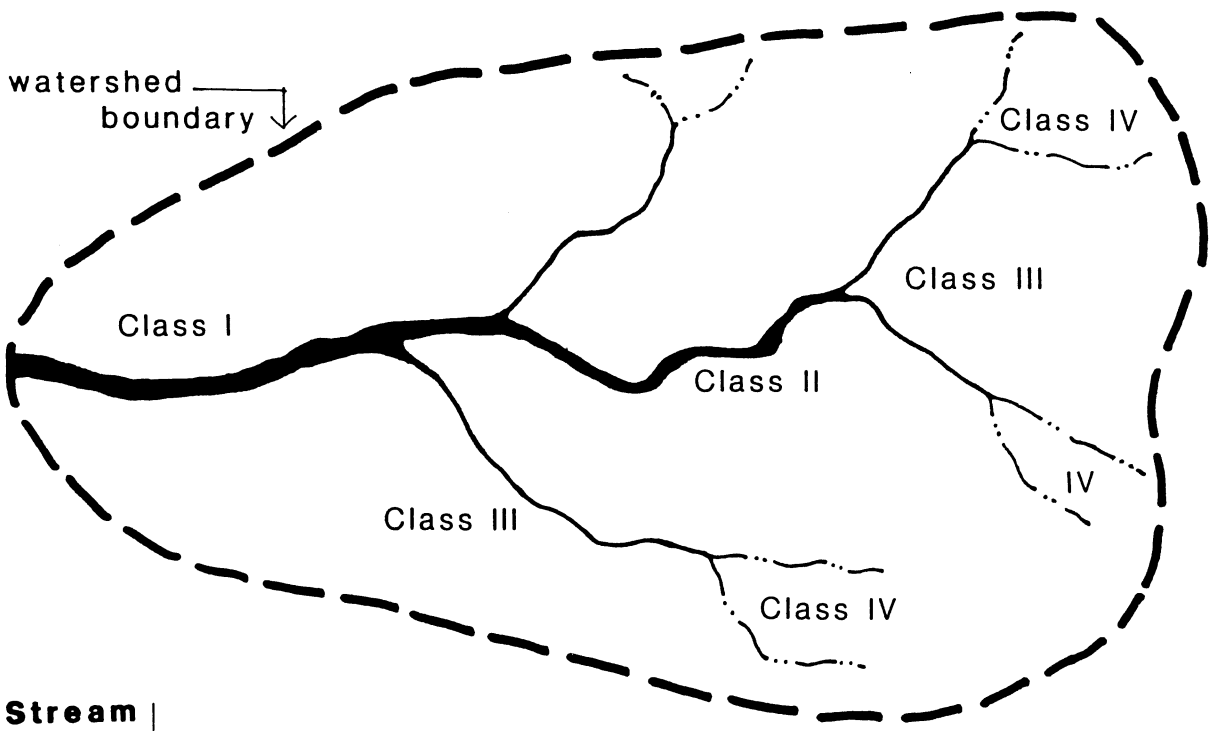


Figure III-E-2 Stream Heirarchy



Stream Class	Qualifying Criteria
I	municipal/ domestic supply, large volume, anadromous fishery
II	resident trout fishery, significant volume to affect Class I
III	perennial stream, no fish present
IV	intermittent flow

The Forest stream classification scheme is based on flow volume and the beneficial uses of a given stream, i.e. municipal/domestic drinking supply, recreation, fisheries.

For a complete discussion see FSM 2526 Willamette Supplement 3 5/81.

Table T001. Stream Class Mileage (III-E-3)

District	Watershed Name	I	II	III	Total
Detroit	Little North Santiam	9.7	20.2	29.9	59.8
	Breitenbush	17.6	47.5	39.6	104.7
	North Santiam	41.4	103.8	127.7	272.9
Sweet Home	Quartzville Creek	9.7	22.0	21.1	52.8
	Middle Santiam	20.2	47.5	54.6	122.3
	South Santiam/Canyon	19.8	44.9	46.6	111.3
	Calapooia/Wiley Creek	2.6	6.2	7.0	15.8
Blue River	Blue River	22.0	59.9	44.0	125.9
	South Fork McKenzie	29.9	66.0	75.7	171.6
	Lower Tribs. McKenzie	2.2	9.7	7.0	18.9
	Quartz Creek	2.2	5.3	11.4	18.9
McKenzie	McKenzie	40.9	9.7	19.3	69.9
	Horse Creek	18.5	8.8	13.2	40.5
Lowell	Fall Creek	37.0	76.6	96.8	210.4
	Winberry Creek	6.6	25.5	19.4	51.5
	Tribs. Middle Fk Willamette	10.1	56.3	46.6	113.0
Oakridge	North Fk Middle FK Willamette	47.5	88.8	126.8	263.1
	Salmon Creek	28.2	50.2	102.1	182.2
	Salt Creek	26.4	37.8	67.7	132.0
Rigdon	Hills Creek	6.2	25.5	51.0	85.4
	Middle Fk Willamette	27.3	128.4	242.0	439.1

Table T002. Current Water Use (III-E-4)

District	Watershed Name	Domestic Water Supply	Hydro Electric Power	Anadro-mous Fish	Resident Fish	Fish Hatch-ery
Detroit	Little North Santiam	X		X	X	
	Breitenbush	X	X		X	X
	North Santiam	X	X		X	X
Sweet Home	Quartzville Creek	X	X	X	X	X
	Middle Santiam	X	X	X	X	X
	South Saniam	X	X	X	X	X
	Calapooia/Wiley	X	X	X	X	
Blue River	Blue River	X		X	X	X
	So. Fork McKenzie	X	X	X	X	X
	Minor Tribs. McKenzie	X		X	X	X
	Quartz Creek	X		X	X	X
McKenzie	McKenzie	X	X	X	X	X
	Horse Creek	X	X	X	X	X
Lowell	Fall Creek	X		X	X	
	Winberry Creek			X	X	
	Tribs. Middle Fk Willamette	X	X		X	X
Oakridge	North Fk Middle FK Willamette	X	X		X	X
	Salmon Creek	X	X		X	X
	Salt Creek	X	X		X	X
Rigdon	Hills Creek	X	X		X	X
	Middle Fk Willamette	X	X		X	X

Table T003. Surface Water Sources[1](III-E-5)

Location	Use Type [2]	Number Users [3]	Intake Location (Miles) [4]	Water Source	Source Area % (>50% USFS)	Watershed
Salem	A	85,667	27	N.Santiam River	72	NS BI DT LS US BL
Detroit	B	336	On Forest	Breit/Mackey	100	BI
Breitenbush Hot Springs	B	220	On Forest	Mansfield Creek	100	BI
Breitenbush	C	150	On Forest	Short Creek	100	BI
Detroit Lake	C	1,560	On Forest	Tumble Creek	100	BI LS BL
Gates	A	452	8	N.Santiam River	90	BI DT LS US BL
Mill City	A	1,522	13	N.Santiam River	82	BI DT LS US BL
Lyons	A	836	20	N.Santiam River	70	NS BI DT LS US BL
Mehama	B	--	20	N.Santiam River	70	NS BI DT LS US BL
Stayton	A	4,373	27	N.Santiam River	72	NS BI DT LS US BL
Turner	A	1,658	27	N.Santiam River	72	NS BI DT LS US BL
Marion Forks	B	72	On Forest	(Unnamed Tributary)	100	US
Marion Forks	D	75	On Forest	Horn Creek	100	US
Marion Forks	C	F	On Forest	Marion Creek	100	US
Riverside	C	185	On Forest	(Unnamed Tributary)	100	LS
Whispering Falls	C	55	On Forest	(Unnamed Tributary)	100	LS
Humbug	C	110	On Forest	Cliff Creek Trib.	100	BI
Camp Pioneer	B	120	On Forest	Pine Ridge Lake	100	SU
N.Sant.Sports Club	B	150	On Forest	(Spring)	100	NW
Stahlman	B	280	On Forest	(Unnamed Tributary)	100	NW
Sweet Home	A	6,722	12	South Santiam River	59	QA MS SS CA
Foster	D	--	11	South Santiam River	59	QA MS SS CA
Eugene	A	101,096	24	McKenzie River	82	BR SM MM QC MK LH UH ST DR LK
Ice Cap	C	120	On Forest	Ice Cap Creek	100	MK
Big Lake	C	150	On Forest	Big Lake	100	MK
Clear Lake	C	55	On Forest	Clear Lake	100	MK
Lowell	B	655	6	Dexter Reservoir	98	MF LN UN SC SL HI LM UM
Big Pool	C	25	On Forest	(Unnamed Tributary)	100	FC
Broken Bowl	C	115	On Forest	(Unnamed Tributary)	100	FC
Westfir	A	200	On Forest	N.F.Md.F.Willamette	100	LN UN
Oakridge	D	F	On Forest	Salmon Creek	100	SC
Blue Pool	C	140	On Forest	Warner Creek	100	SL
Sand Prairie	C	170	On Forest	Md. Fork Willamette	100	LM UM

[1]More than 25 users
[2]A = Municipal, B = Uninc/Private, C = Campground, D = Fish Hatchery.
[3]City populations from 1980 Census; Recreation site users from RIM PAOT capacity.
[4]Approximate river miles from the Forest boundary to the intake.

	CODE	WATERSHED	CODE	WATERSHED
KEY	NS	Little North Santiam River	QC	Quartz Creek
	BI	Breitenbrush River	UH	Upper Horse Creek
	DT	Detroit Tributaries	LH	Lower Horse Creek
	DR	Deer	SM	South Fork McKenzie
	LS	Lower North Santiam	CA	Canyon
	US	Upper North Santiam	FC	Fall Creek
	HA	Hackleman	WC	Winberry Creek
	SS	South Santiam River	MF	Tributary of Middle Fork of Willamette
	MK	McKenzie River	LN	North Fork of Middle Fork of Willamette
	CW	Wiley Creek/Calapooia	SC	Salmon Creek
	QA	Quartzville Creek	SL	Salt Creek
	MS	Middle Santiam	HI	Hills Creek
	BR	Blue River	LM	Lower Middle Fork Willamette
	MM	Lower Tribuatries McKenzie	UM	Upper Middle Fork Willamette
	BL	Blowout	UN	Upper North Fork of Middle Fork of Willamette
	ST	Scott Creek	WL	Wilderness Lakes
	LK	Lookout		

There are three fish hatcheries located on the Forest, and five other fish production facilities located within 5 to 15 miles of the Forest boundary (Stewart and Skeesick 1982). The eight facilities consist of seven hatcheries and one catch/release site and were developed either as required mitigation for construction of the flood control reservoirs, or to augment natural fish production. Marion Forks and Willamette salmon and trout fish hatcheries are located on Forest land and operate under special use permits.

Without the suitable quality water produced from the Forest, the eight facilities would not be able to operate in an economically efficient manner and still meet their mitigation obligations (Stewart and Skeesick 1982). The quality of the water at Marion Forks and Willamette salmon and trout hatcheries is directly attributable to Forest practices and land use activities; at the other five facilities the activities of private landowners and the operation of upstream reservoirs also affect the quality of water received.

Approximately 71.5% of Forest recreation is water oriented, generating an estimated value of $17,359,000 annually. Figure III-E-6 lists water oriented recreation use by various categories.

Table T004. Water Related Recreation Use (III-E-6)

	Developed Use (MRVDs)	Dispersed Use (MRVDs)	Wilderness Use (MRVDs)	Total Use (MRVDs)	Percent of Forest Use
Camping	812.8	154.6[1]	60.3	1027.7	35.6
Organized Camping	69.2	--	--	69.2	2.4
Picnicking	103.4	20.8[2]	--	124.2	4.3
Fishing	11.8	234.4	14.5	260.7	9.0
Swimming	81.1	49.6	17.0	147.7	5.1
Boating	98.2	127.5	0.6	227.3	7.8
Hunting[3]	--	4.0	--	4.0	0.1
Drive/Sightseeing[4]	8.0	196.8	1.8	206.6	7.2
Percent of Use Type	83.2	62.0	48.9	2067.4	71.5

Use is expressed in Thousand Recreation Visitor Days (MRVDs).

[1]Assumes 90% of dispersed site camping is associated with streamside area.
[2]Assumes 50% of dispersed site picknicking is associated with streamside areas.
[3]Assumes 5% of hunting is associated with streamside areas.
[4]Assumes 50% of driving/sightseeing is associated with streamside areas.
[5]All other values represent 100% of the respective activity.

Water Yield

Streamflow from the Forest forms the headwaters of the North and South Santiam, McKenzie, and Middle Fork Willamette rivers, and reflects the precipitation regime of the Pacific Northwest. The regions' maritime climate is characterized by a distinct winter rainy season, when 90% of the 40 to 90 inches of precipitation falls from October to May. Approximately 85% of annual runoff occurs during the 5 months between November 1 and March 31. Annual runoff is measured on the basis of "water years", which begins October 1, runs through September 30 of the succeeding year. Current demand for water in the other 7 months of the year is being met with only 15% of the annual water yield. This includes during the summer low flow period (July-September), when streamflow is less than one-tenth of the average winter flow.

Water yield, or the volume of runoff from the Forest, is the result of the balance between precipitation and physical characteristics of the land. The type, amount, distribution, and timing of precipitation, as well as land form, vegetative cover and soil type influence the volume and timing of runoff. Total water yield from the Forest was estimated at 8.9 million acre feet per year by Hubbard (1983). Annual water yield by watershed is listed in Figure III-E-7.

Table T005. Water Yield by Watershed (III-E-7)

		Area		Water Yield	
District	**Watershed**	**Acre**	**Sq. Mile**	**AcFt/SqMi**	**AcFt/Year**
Detroit	Little North Santiam	38,117	59.56	5,070.7	302,011
	Breitenbush River	62,262	97.28	4,072.5	396,173
	North Santiam	213,812	334.49	11,103.9	1,222,029
Sweet Home	Quartzville Creek	35,621	55.66	5,149.4	289,616
	Middle Santiam	57,676	90.12	4,517.9	407,153
	South Santiam/Canyon	92,124	143.94	3,479.6	500,854
	Calapooia River/Wiley Creek	10,430	16.30	5,041.4	37,494
Blue River	Blue River	54,690	85.45	4,047.9	345,893
	South Fork McKenzie	138,837	216.93	2,957.3	641,527
	Lower Tributary McKenzie	26,918	42.06	1,955.8	82,260
	Quartz Creek	16,232	25.36	1,955.8	49,599
McKenzie	McKenzie River	225,245	351.95	3,738.8	1,315,871
	Horse Creek	103,557	161.81	3,738.8	604,975
Lowell	Fall Creek	79,817	124.71	2,628.4	327,788
	Winberry Creek	22,631	35.36	2,059.8	72,835
	Tributary Middle Fork Willamette	49,998	78.12	2,059.8	160,912
Oakridge	North Fork Middle Fork Willamette	154,450	240.33	4,821.6	581,798
	Salmon Creek	84,722	132.38	2,861.6	378,819
	Salt Creek	68,725	107.38	2,537.0	272,423
Rigdon	Hills Creek	41,402	64.69	2,213.0	143,159
	Middle Fork Willamette	221,469	346.05	4,420.0	764,909
TOTAL		1,798,735	2,809.93	3,166.7	8,898,098

Water Quality

Protection of water quality and quantity on the Forest is required by the laws which created the National Forests, by the Clean Water Act, the Federal Water Pollution Control Act (FWPCA) and amendments, and most recently by the National Forest Management Act. The FWPCA permits the States to enforce State and local water quality laws on Federal land, and the National Forest Act states that National Forest lands will be managed "to prevent detrimental changes in water flow and water quality." In addition, many Federal and State laws regulate the establishment and existence of water rights on National Forest land. For additional information on relationships with the plans and policies of others see Chapter IV, Water.

Water flowing from the Forest in the four major river basins is generally of high quality, and supports a variety of uses. Principal water quality concerns are water temperature, turbidity, sediment, introduced chemicals, and bacterial contaminations. Specific water quality concerns on the Forest vary by time of year. High turbidity and suspended sediment concentrations are primarily associated with storm runoff, and peak during the autumn and winter months. Water temperature peaks occur during the summer minimum flow period. Peak concentrations of bacterial contaminants generally occur during the summer months in conjunction with warm water temperature and high recreation use. Introduced chemical concentration occurs by chance at virtually any time of the year, either by accident during application or transport on the highways or railroad which bisect the Forest.

Water temperature is a critical parameter for the fish that populate Forest streams, and is directly related to the amount of stream surface area exposed to direct solar radiation. Since water temperature is an important factor affecting the beneficial uses associated with Oregon's salmon and trout fisheries, the State of Oregon has established a water quality standard for water temperature. The standard requires the maintenance of water temperature at 58 degrees Fahrenheit or less, or at existing temperature if naturally greater than 58 degrees Fahrenheit.

The Forest is far enough south that long daylight periods and low summer stream flows may result in critical stream temperatures. Maximum daily water temperatures in July and August in streams draining watersheds with elevations predominantly below 4,000 feet, can reach the mid 60 degrees Fahrenheit to low 70 degrees Fahrenheit. These temperatures may be detrimental to salmon and trout, whose optimum feeding, rearing, and spawning activity takes place between 50 degrees Fahrenheit and 57 degrees Fahrenheit.

Salmon Creek and Fall Creek are two watersheds in which water temperature is of particular concern as compared to most of the watersheds on the Forest. The Oregon Department of Fish and Wildlife operates two hatcheries on water withdrawn from Salmon Creek. Water temperature is critical in terms of optimizing the economic efficiency of the hatcheries; an increase of a few degrees in water temperature can dramatically increase the cost per fish produced. Fall Creek, along with principal tributaries, Little Fall Creek and Winberry Creek, contains an important population of wild winter steelhead trout. The Fall Creek watershed tends to have lower minimum flows than other watersheds of similar size on the Forest. As a result, Fall Creek and its tributaries are more sensitive to activities which remove shading vegetation and potentially increase water temperatures. Past forest management activities and flood events have removed riparian vegetation resulting in increased summer peak stream temperatures in some streams on the Forest. Recent research and Forest monitoring have documented an apparent drop in peak summer water temperature in Salmon, Fall, and Winberry Creeks (Beschta and Taylor 1986), (Total Resource Inventory, Aquatic Subsystem files). This decline is attributed to the shading effect of recovering riparian vegetation.

The most visible characteristic of water quality is suspended sediment which affects the clarity of water. Sediment concentrations and resultant turbidity (clarity), are the water quality attributes most readily and frequently influenced by natural events and human activity. Sediment is primarily eroded soil transported to the stream system, originating from a variety of natural and human-induced sources. There is a natural amount of sediment in streams, which is a necessary and vital part of the aquatic ecosystem. Salmon and trout, for example, require gravel and cobbles of specific sizes and amounts to reproduce.

Sediment is made up of two main components that are defined as follows:

- Suspended sediment--material that the stream carries within the column above the bed or bottom of the stream.

- Bedload sediment--material, ranging in size from sand to gravel and boulders that is moved at or just above the bed of the stream.

The amount of sediment in a stream at any given time is dependent on stream flow and sediment supply. The sediment supply is a function of the amount, type, timing, and location of ground disturbing activities and natural events which expose soil to erosion. Of equal importance is the efficiency of the watershed in transporting the eroded soil to and through the stream system.

High turbidity and/or suspended sediment may cause reduced potability, increased domestic use treatment costs, and reduced aesthetic quality, angler success, and fishery productivity.

Sediment thresholds are difficult to discern, tend to be watershed specific, and are unique to the use in question. The potential significance of sediment elevated above natural levels is well documented by research (Swanston et al. 1986; Triska et al. 1982; Martin et al. 1981).

High bedload and deposited fine sediment may result in reduced fish habitat quantity and quality, reduced pool volumes, fish spawning success, and fish prey base. High bedload and deposited fine sediment may also result in reduced channel stability due to reduced channel capacity; increased water temperature, due to shallower, more readily heated channels; increased rates of sediment deposition in reservoirs, and increased cost of hatchery operations.

For eroded soil to be of consequence to water quality, it must be delivered to the stream channel. All watersheds are not equal in ability to transport eroded soil to a stream.

Thirteen watersheds have areas of channel instability or sediment related effects. They are Fall, Winberry, Quartz, Quartzville, Wiley and Hills Creeks and the Breitenbush, South and Middle Santiam, Calapooia, Middle Fork Willamette, Upper Middle Fork Willamette, and North Fork Middle Fork Willamette rivers. Seven of these watersheds are heavily influenced by other ownerships; Quartz and Wiley Creeks, and the Middle Santiam, South Santiam, Calapooia, Middle Fork Willamette and Upper Middle Fork Willamette rivers. All 13 of these watersheds currently support a wide variety of uses, ranging from domestic water supply to anadromous fisheries (see Figure III-E-4).

The presence or absence of large woody debris such as downed logs and limbs is an important factor in whether sediment inputs affect channel stability or aquatic habitat. If sufficient large woody debris is present, a stream may be able to accommodate an increase in sediment without suffering a decline in fish habitat (Heller et al. 1983).

Large woody debris provides a stream a means to dissipate the waters' energy; store needed sediment and fish spawning gravels; and scour pools (Keller and Talley 1979).

Large woody debris pushes flood water on to adjacent floodplain areas reducing the amount of damage to the stream channel. A stream that is lacking in large woody debris tends to be more uniformly broad and shallow with fewer pools and spawning gravel accumulations and is more prone to channel scour by flood flows (Keller and Talley 1979). A bedrock confined channel without large woody debris may scour down to an underlying bedrock pavement becoming devoid of habitat for most aquatic organisms.

In general, the mature stands of trees along the fish-bearing Class I and II streams on the Forest contain trees of sufficient size to provide large woody debris. Due to past practices, however, the amount of large woody debris within the streams has been reduced. Merchantable wood was salvage logged from streams and/or nonmerchantable material was removed to improve fish passage, minimize bank

erosion, and protect improvements such bridges and culverts. In addition, standing timber and snags, which would have been the most likely to fall into the stream to become large woody debris were salvage harvested particularly if they were in close proximity to a road (Stewart and Skeesick 1982).

As of 1981, approximately 39% or 1,313 miles of perennial Class I, II and III streams were adjacent to harvest units or roads (Stewart and Skeesick 1982).

As a result of these practices, most streams and rivers on the Forest are considered to be deficient in large woody debris volume and distribution. As a consequence, many have experienced channel scour and bank erosion during flooding and have reduced fish habitat quality and quantity compared to natural levels.

The Breitenbush River is currently being studied to determine the effects of past management of large woody debris and the options for future management. The Breitenbush River has a sensitive channel system comprised of small bedload material. Recently the river has tended to migrate across its floodplain, eroding streambanks, and causing damage to property and fishery values.

Two other areas on the Forest have exhibited similar tendencies. In 1983, Lyons and Beschta documented that deposition of sediment in the Upper and Middle Fork Willamette River above Hills Creek had resulted in the destabilization of the channel and that the effects still persisted. Wiley Creek and the Calapooia River have a similar problem; these two drainages contain only small proportions of Forest land.

In the Quartzville Creek, South and Middle Santiam River watersheds, aquatic habitat has been degraded in the main channel as well as in many tributary streams. Stretches of stream with sediment deposition and channel migration are common resulting in greatly reduced pool volume (Stewart and Skeesick 1982; stream surveys in Total Resource Inventory, Aquatic Subsystem Files; DEQ Report 1978).

Fall, Winberry, Hills, and Quartz Creeks and the North Fork Middle Fork Willamette River differ from the other drainages cited in that deposited sediment is not generally evident. In these drainages the presence of bedrock control on the channel, combined with a limited amount of large woody debris, has apparently provided a mechanism by which sediment is flushed from the stream system. These streams have higher turbidity levels and tend to be deficient in pool volume, as well as spawning gravel.

Future Trends

The greatest potential for increasing the usable supply of water at points of principal demand is through the increase in storage capacity of reservoirs. This approach allows for the delay of runoff until the time of greatest demand. The potential for additional water storage on the Forest does exist if new dams were to be constructed.

Existing dams could be upgraded to increase the production of electrical power (Klingeman 1980). In addition, an estimated 2,300 megawatts of power could be available 50% of the time with the installation of low head hydro-projects on many of the Forest's smaller rivers and streams (Klingeman 1979).

Recreation use of the surface waters is expected to increase by 10 to 25%. As a result, a shift in the distribution of experience level would occur because of an increase in the density of recreation users.

Water use potential is contingent upon water supply availability, development of water structures, and changes in the distribution of recreation experience levels. On-Forest water supply is expected to exceed

demand well beyond the planning horizon. Off forest, much of the water has been legally claimed, though it is likely that the claimed water rights exceed the actual use.

AIR

Air directly affects plant, animal and fish habitat, and contributes to the scenic and recreational attributes of the Forest and nearby communities. Clean air is a renewable resource, influenced by a number of factors including the weather, topography, and emission sources. The mountainous Forest lies approximately 80 miles east of the Pacific Ocean, between the Willamette Valley and the desert plateau of Central Oregon. The airshed is generally under the influence of maritime westerly winds.

Historic Trends

The condition of the airshed over and adjacent to the Forest has always been affected by smoke and odor from fires and to a lesser degree by dust from roads and unvegetated fields. Early in this century, many of the large catastrophic fires in Western Oregon had their origin in logging slash. In response to these timber operations related fires, the State of Oregon enacted stringent laws requiring private landowners to abate the slash resulting from logging activities. Thus, slash burning became an early forestry practice in Oregon.

Since the 1940s, prescribed fire has been extensively used to dispose of slash created from logging activities on the Forest and on lands adjacent to the Forest. Prior to the 1970s, broadcast burning during the fall was the predominant use of prescribed fire. Burning of machine and hand piled slash was also done to a lesser degree, but there was little use of prescribed fire to meet other land management objectives besides hazard reduction and site preparation.

Residents of the Willamette Valley expressed objections to the reduced air quality in the late 1960s and early 1970s. Burning of grass fields in the Willamette Valley was the original concern, but since most of the Forest slash burning was done in the fall and impacted the air quality of the Willamette Valley, it was also recognized as a contributor to the air quality problem. This concern resulted in State laws and smoke management practices which affected use of prescribed fire on forest lands including National Forest land.

The Oregon Smoke Management Plan was adopted by the Oregon Department of Forestry, federal land management agencies, and the Department of Environmental Quality (DEQ) in January of 1972. The objective of the Plan is "to keep smoke resulting from burning on forest lands from being carried to or accumulating in designated areas or other areas sensitive to smoke." The State Forester is responsible for the coordination and control of the Oregon Forest Smoke Management Plan.

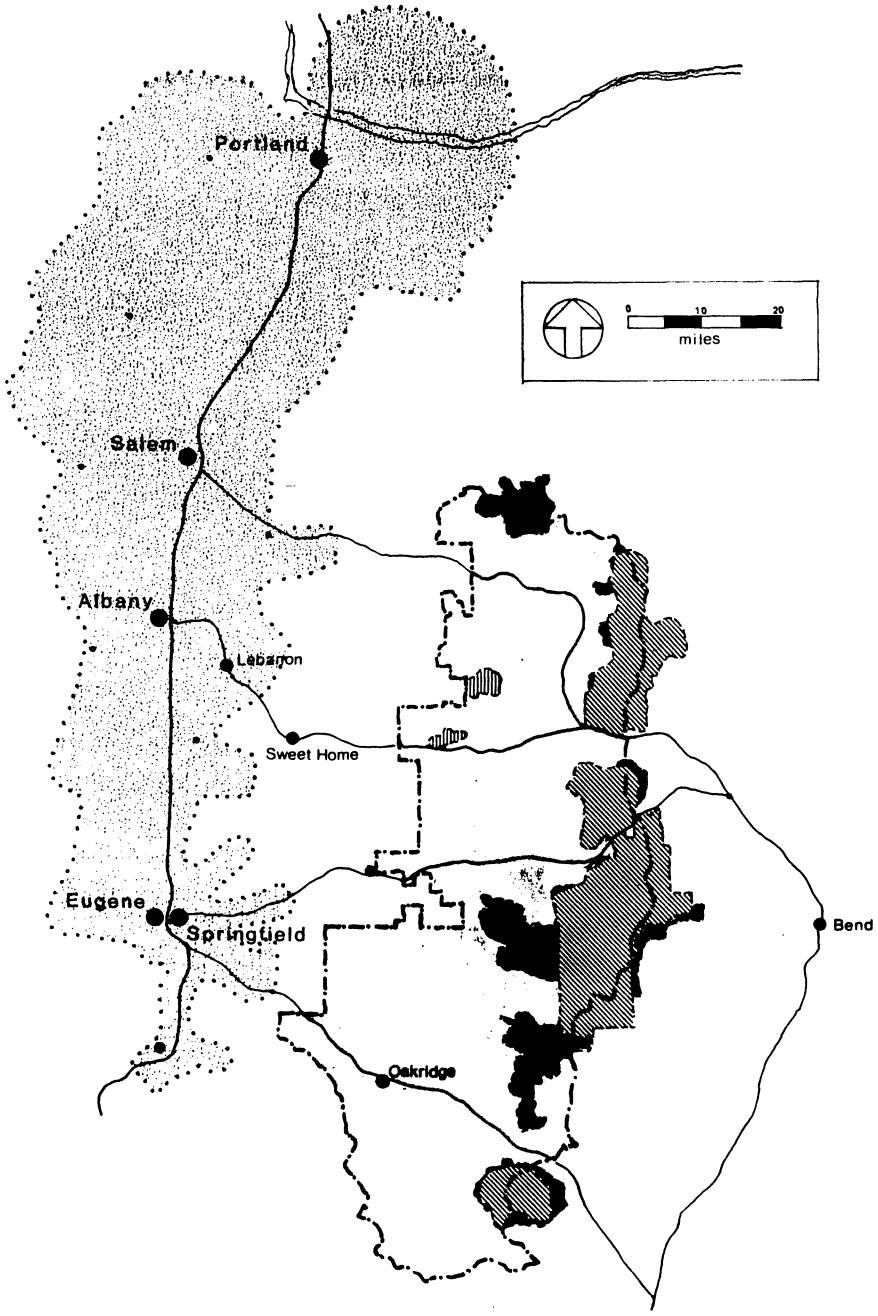
The Clean Air Act designated all National Wildernesses established before August 7, 1977, as Class I. Examples of the Wildernesses that are Class I are Mt. Jefferson, Mt. Washington, Three Sisters, and Diamond Peak. All other lands in the state including any Wilderness additions made after August 7, 1977, are assigned Class II status with the state having redesignation authority. Figure III-F-1 shows the Federally mandated Class I areas, new Wildernesses eligible for Class I re-designation and smoke sensitive areas adjacent to the Forest.

The Clean Air Act, as amended in 1977, directs Federal agencies to comply with state and local regulations directed at preventing and controlling air pollution. The 1977 Amendment includes provisions to prevent significant deterioration of air quality in Class I areas. Class I allows the least increase in air quality deterioration, while Class III allows the pollution levels up to the National Ambient Air Quality Standards to be considered acceptable. The baseline concentrations for particulate matter and sulfur dioxide are being established. There are no Class III areas in the state.

Figure III-F-1.

WILLAMETTE NATIONAL FOREST

Areas of Air Quality Concern



LEGEND

WILDERNESS:
Federally mandated Class I area.

WILDERNESS ADDITIONS:
Federally mandated Class II -- eligible for redesignation to Class I.

WILDERNESS ADDITIONS:
Class II areas 10,000 acres -- not eligible for redesignation.

DESIGNATED AREA:
Oregon Smoke Management Plan

Outside of the Designated Areas populated communities in the Willamette Valley and in Central Oregon are also considered smoke sensitive areas.

The identification of unacceptable impacts is accomplished through the formal process associated with the Prevention of Significant Deterioration requirements of the Clean Air Act Amendments of 1977. This law targets Class I areas for protection and preservation of the area's air quality from fixed point pollution sources. The Air Quality Related Values (AQRVs) are features or properties of a Class I Wilderness that are affected in some way by air pollution. These can include, but are not limited to, odor, fauna, flora, water, and visibility. The Forest has the responsibility to protect these values. Visibility and the deposition of acid rain in the high lakes are currently of concern. Both are being monitored to determine the level of acceptable change associated with protection of AQRVs. Very little information is available about the affects of acid rain on the Forest.

Current Situation

Smoke from prescribed burning causes the most notable impact to air quality over the Forest. Other agencies and private land owners including the Forest contribute to this temporary condition. Although these are recurring activities, the impacts are generally temporary in nature because of the prevailing wind patterns that cleanse the air in the valleys and mountains on a regular basis. Air quality impacts from other Forest management activities are also temporary in nature and may result from dust and vehicular emissions from logging operations, public travel on Forest roads, or chemicals used for the control of insects, diseases and vegetative management. In addition to the impacts generated by Forest activities, the air quality of the area is also impacted by field burning smoke and by wind-borne dust from lands located off Forest.

Figure III-F-2 displays the number of acres treated by burning, the estimated tons of fuel burned, and estimated tons of total suspended particulates (TSP) in the resulting smoke. Since 1979, the amount of fuels treatment has averaged 14,170 acres a year. Since 1981 the decline in acres burned has paralleled the decline in timber harvest. During this same period an increase in spring burning and various specifications for the piling of unmerchantible material have also contributed to a reduction in TSP emissions by reducing the total amount of material burned on harvest units.

Several areas outside the Forest are identified in the Oregon Smoke Management Plan as smoke sensitive or "Designated Areas" within the influence of the Forest. The Smoke Management Plan calls for minimizing smoke intrusions into high population centers of air quality concern such as the Willamette Valley and Roseburg. The Willamette National Forest prescribed burning program is also managed to avoid intrusions into the Bend and Redmond population centers. In addition, during the months from mid-July to mid- September, a priority burning system is implemented in Western Oregon. This reduces the amount of prescribed burning on Forest land during the time when the most acreage of grass seed fields is being burned in the Willamette Valley.

Visibility is monitored on a continuing basis in a cooperative effort by the DEQ, National Park Service, and the Forest Service. It is measured by atmospheric discoloration and change in visual range. Instruments located on Black Butte and near Big Lake monitor visibility for the Mt. Jefferson, Mt. Washington, and the Three Sisters Wildernesses. Air Quality in the Diamond Peak Wilderness is monitored at Cinnamon Butte. Data from this monitoring program indicated that prescribed burning was a significant contributor to visibility impairment. As a control strategy the Oregon State Implementation Plan imposes a prohibition on prescribed burning in the Central Oregon Cascades from Lane County north, except under specified conditions, from July 4 through Labor Day. The Forest has implemented a policy of no prescribed burning during this period without the prior approval of the Forest Supervisor. This prevents significant deterioration of the airshed during the heavy use period in the Mandatory Class I areas.

Table T007. Acres Treated by Burning (III-F-2)

Year	Broadcast Burn Acres	Pile & burn Acres	Total Acres	Tons Consumed [1]	Tons TSP [2]
1979	6,235	10,123	16,358	654,320	16,358
1980	7,038	13,056	20,094	803,760	20,094
1981	7,741	8,781	16,522	660,880	16,522
1982	4,803	7,497	12,300	492,000	12,300
1983	6,939	4,700	11,539	461,560	11,539
1984	6,706	4,171	10,877	435,080	10,877
1985	7,808	3,711	11,519	460,760	11,519
TOTAL	47,270	51,939	99,209	3,968,360	99,209
AVERAGE	6,753	7,420	14,173	566,909	14,173

[1]Based on Forest estimate of 40 tons/acre consumed for broadcast and pile burning.
[2]Based on 50 pounds of total suspended particulate (TSP) emissions per ton of fuel consumed (Ward, McMahon, and Johansen 1976).

Visibility is measured by atmospheric discoloration and change in visual range. Monitoring of the Diamond Peak Wilderness indicates that the visual range is quite good. Median summer ranges of visibility were from 90 to 102 miles. More study is required from this site. The other three Wildernesses showed a median visual range of 92 miles (DEQ 1985). Detailed monitoring data and other information about air quality is available through the DEQ Air Quality Division or at the Forest Supervisors Office in Eugene.

Air quality impacts from woodheating are different than those associated with prescribed burning of logging slash. Most of the wood that is burned as firewood comes from the surrounding forested lands. Wood is made available to residential woodheating users from logging residues, rather than being burned in a prescribed fire. As a consequence, air quality impacts shift to the urban setting. While slash burning generally creates a visibility issue over and adjacent to the Forest, woodstoves contribute to air quality impacts which are a human health concern. Smoke particles emitted from incomplete combustion of wood may have relatively high concentrations of compounds that are known and suspected carcinogens.

Winter air stagnation resulting in air pollution from woodstoves is an increasing problem in the populated valleys of the region. Firewood is usually burned in the winter during periods when colder air and temperature inversions occur. The location of burning shifts from generally higher altitudes, which are more favorable to dispersion and remote from other air pollution sources, to lower elevations with less dispersive conditions and in proximity to other pollution sources.

The Lane Regional Air Pollution Authority estimated that 92,000 cords of wood were burned locally in the Eugene-Springfield area in 1984. This was an increase of 30% over 1982 estimates. Two areas, Oakridge and Northwest Eugene, experienced violation of the secondary Federal standard of total suspended particulates in 1984. In December of 1985, there were violations of the primary standard (health-related). As of July 1, 1986, State law requires stringent emission controls on all wood burning stoves sold within the Oregon.

Future Trends

Since the mid-1970s there has been an increasing interest in utilizing residues as an alternative energy source or for other products. As a result, there has been some criticism of current slash burning practices because the perception is that a valuable resource is being wasted. The fossil fuel equivalent of the slash created on the Forest annually is around 3.4 million barrels of oil, which does represent a significant potential energy resource. In response to this issue and to internal concerns, the Forest, in cooperation with other government agencies and industries has initiated several pilot projects and studies to determine the feasibility and technology necessary to utilize wood residues economically. Utilization of logging residues is expected to increase as it becomes more economically feasible, thus reducing the amount of residue requiring removal. Utilization will continue to be balanced with the need to have vegetative material on site to ensure nutrient recycling and continued site productivity.

The number of acres treated through prescribed fire may be reduced in the future due to limitations imposed by air quality considerations. As a result of a reduction in burning, other more costly treatment methods may be necessary to reduce the amount of logging residues for site preparation and hazard reduction.

Smoke from residential woodheating will be more of a concern as more people use wood to heat their homes. This wood smoke along with automobiles and industrial emissions will continue to create health hazards during periods of air stagnation.

In the near future, there will be regulations covering fine particulates, redesignation of Wilderness Class II to Class I, inventories of values associated with AQRVs, air pollution source identification, pollution damage determination, and establishment of limits of acceptable change in air quality. Research will determine how to reduce emissions.

Visibility will improve by implementation of current regulations and as regulatory smoke management requirements become more strict. Overall, emissions from prescribed burning are expected to remain at or below current levels.

VEGETATION

The vegetative cover of the Forest provides habitat for wildlife and protection to streams and rivers while stabilizing soil, producing oxygen and humidity, and serving as a vast storehouse of energy. Plants modify the air temperature by providing protection both from the summer heat and the winter cold and wind. The lush richness on the plants on the WNF provide an outstanding array of recreational settings.

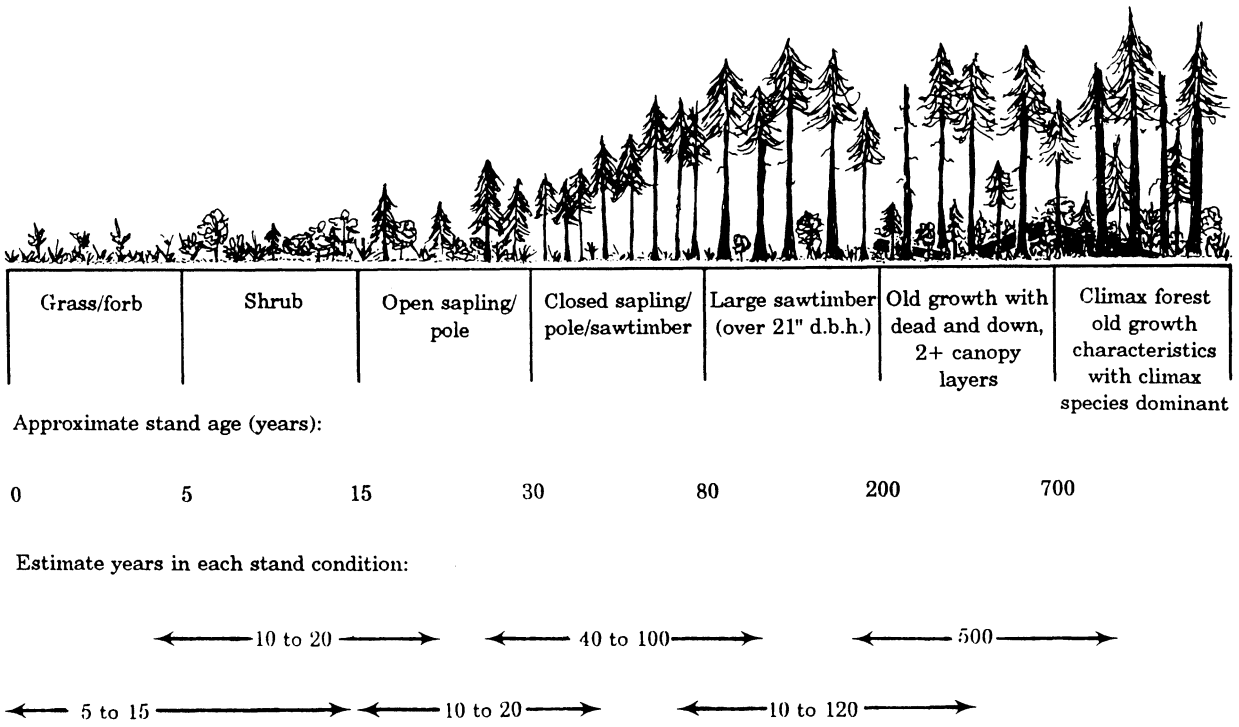
Plant populations which have existed on a site for a long period have come into balance with, and are useful indicators of, their environment. Classification of long-term, stable plant communities, combined with soils information, is a tool for evaluating site productivity and determining future implications for management.

This section of Chapter III discusses plant communities, riparian zones, old-growth, and threatened, endangered and sensitive plant species on the Forest. Timber and its use as a commodity resource is described in Chapter III, Timber.

Plant Communities

There are a number of plant communities on the Forest including those within coniferous forests, meadows, subalpine and alpine parklands and wetlands. Succession is the natural process by which one plant community or stand condition changes into another. (See Figure III-G-1, Successional States.) As Forest tree species develop and mature, whether they are deciduous or coniferous, the canopies close and herbs and shrubs that require direct sunlight start disappearing. Temperature, moisture, light, and available nutrients are the factors which determine those plants which can most effectively occupy a site. After a relatively long, disturbance-free period, only those plants which can grow and reproduce in competition with their neighbors remain. On the WNF old growth conditions may develop in undisturbed stands long before development of a climax forest occurs. Unless modified by disturbance, the growth of vegetation continues until the climax stage is reached. Climax forests rarely occur in the Pacific Northwest. Although catastrophic natural disturbances are relatively infrequent pioneer conifer species can be very long lived (Hemstrom 1979, Henderson and Peter 1981, Burke 1979, Morrison 1984).

Figure III-G-1. Successional States



Successional pattern of stand conditions after clearcutting and broadcast burning.

The vegetation of the Forest can be grouped into five major coniferous series and several other series which are dominated by grasses or shrubs. The coniferous series are characterized by both trees and understory vegetation. Within each series, there may be several plant communities or associations. These plant associations are indicators of distinct vegetative response and site productivity. For a detailed description of plant associations and their implications for resource management reference the *Preliminary Plant Association and Management Guide* for the Forest (1987).

The following descriptions of the vegetative series on the Forest rely on Hemstrom, Logan, and Pavlat (1987) and Franklin and Dyrness (1973). Plant distribution is dependent upon a number of factors including species characteristics, precipitation, temperature, and landscape patterns.

The Douglas-fir series occurs on warm, relatively dry sites across the Forest. This series is a northern extension of the Sierran mixed conifer forests common in the southwestern Oregon Cascades, Siskiyou Mountains, and Sierra Nevada Range (Franklin and Dyrness 1973). The Douglas-fir series is rare north of the McKenzie River, occuring only on steep, south-facing slopes with thin, rocky soils (Means 1980). South of the McKenzie River, climax Douglas-fir sites are relatively common at lower elevations on southerly exposures, especially in the Rigdon Ranger District. The major climax tree species include incense cedar and grand fir, but Douglas-fir generally dominates both the canopy and regeneration layer. Western hemlock is scarce or absent. Important species include: Douglas-fir, incense cedar,

sugar pine, ponderosa pine, big leaf maple, oceanspray, poison oak, tall Oregon grape, dwarf Oregon grape, salal, whipple vine, grasses, snow queen, yerba buena, and others typical of Southwestern Oregon.

The Douglas-fir series occupies the driest environments capable of supporting closed forests on the Forest (see Means 1980 for a more extensive discussion). High summer temperatures increase environmental stress. Precipitation is relatively low (45 inches from November to May). Winter snow is usually transient. These factors add up to a long, dry, warm growing season. On the driest sites, conifer canopies give way to open woodlands of Douglas-fir, Oregon white oak, pines, and grasses.

On slightly more moist sites, the Douglas-fir series melds into the western hemlock series. In this transition area, grand fir and western hemlock are co-climax on many sites south of the McKenzie River. This transition area comprises the grand fir series. Franklin and Dyrness (1973) did not consider grand fir climax types separately from the rest of the mixed conifer zone in Southwestern Oregon. Several grand fir plant associations were separated from the Douglas-fir and western hemlock series because grand fir appears to be the dominant climax species and grand fir series have often been described in Southwestern Oregon (Atzet and Wheeler 1984) and east of the Cascade Crest. Climatic information is generally not available, but conditions should be intermediate between the Douglas-fir and western hemlock series.

The grand fir series most frequently occurs on relatively dry, south-facing slopes and excessively well-drained river terraces. It extends into upper elevations south of the McKenzie River, where it mixes with the Pacific silver fir series. Important species include a mixture from the Douglas-fir series, the western hemlock series, and the Pacific silver fir series.

The bulk of lower elevation forests fall into the western hemlock series. In the Cascades, the western hemlock series extends from British Columbia south to the divide between the North and South Umpqua rivers (Franklin and Dyrness 1973). Important species include: Douglas-fir, western hemlock, western redcedar, big leaf maple, vine maple, dwarf Oregon grape, salal, rhododendron, swordfern, vanilla leaf, oxalis, twinflower, and redwoods violet.

Climatic conditions of the western hemlock series reflect a strong maritime influence, with mild, wet winters and relatively dry, sunny summers. Temperatures range from slightly below freezing in winter to 90 to 100 degrees Fahrenheit in summer. Precipitation amounts vary from about 60 to over 100 inches per year, mostly falling as rain or snow in the winter. Winter snowpacks are not usually deep nor long lasting.

The Pacific silver fir series occurs on the western slopes of the Cascade Range from British Columbia south to near the southern end of the Forest (Franklin and Dyrness 1973). The Pacific silver fir series dominates upper-slopes (3,000 to 5,500 feet) on the Forest mixing with the mountain hemlock series at the higher elevations. Important species include: Douglas-fir, noble fir, Pacific silver fir, mountain hemlock, western hemlock, lodgepole pine, vine maple, dwarf Oregon grape, big leaf huckleberry, Alaska huckleberry, rhododendron, grouse huckleberry, Cascades azalea, foamflower, false solomon's seal, queencup beadlily, dogwood bunchberry, sidebells pyrola, and beargrass.

Most of the annual precipitation in the Pacific silver fir and mountain hemlock series falls in winter and accumulates as a deep snow pack at upper elevations. Mean maximum air temperatures usually occur in August and range from about 75 degrees Fahrenheit to about 63 degrees Fahrenheit at the transition to the mountain hemlock series. Growing seasons are short at upper elevations and summer frost frequently occurs in openings, particularly on gentle topography (Halverson and Emmingham 1982). Moisture stress can be higher in seedlings planted in cold soils because root growth and function are impeded (Halverson and Emmingham 1982).

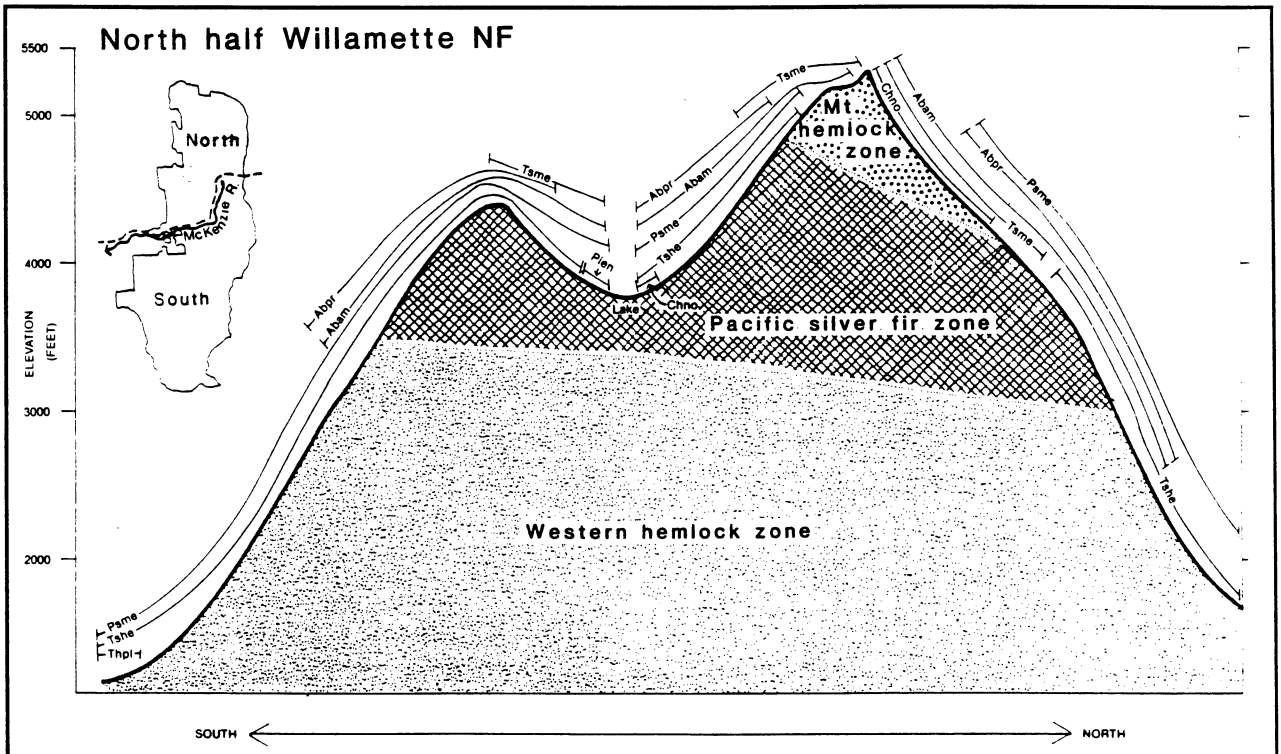
Shrub and herb distributions change gradually from the north to the south end of the Forest. Fool's huckleberry and Cascade azalea are uncommon south of the North Santiam River and rare south of the McKenzie River. Devil's club is not widespread south of the McKenzie River (except in the Little Fall Creek drainage on the Lowell Ranger District) but is relatively common on the Detroit and Sweet Home Ranger Districts. Species characteristic of dry sites in the Douglas-fir series are locally common on the Rigdon and Oakridge Districts but rare farther north. Most notable among these are ponderosa pine, sugar pine, incense cedar, tall Oregon grape, poison oak, and whipple vine.

Nonforest types vary from small meadow openings in a forest matrix to rock cliffs, avalanche chutes, and extensive alpine and subalpine parklands. In general, stable nonforest communities indicate extreme environmental conditions: extremely rocky substrates, extremely dry or wet areas, extremely severe winter conditions, etc. Some nonforest openings are the result of disturbance in otherwise forested conditions. In these cases, down logs, abundant charred wood or other signs of the previously existing forest are usually present. Some openings may be the result of heavy domestic livestock grazing; others were caused by humans who controlled the tree or shrub vegetation. Historically their primary use was to feed livestock, particularly sheep (i.e., Mutton Meadows and Rigdon Meadows). Now elk and deer feed in these meadows.

There are two kinds of wetland communities. Soils supporting these communities are saturated with moisture a major part of the year. Herbaceous wetlands have less than 60% woody cover and are generally dominated by rushes, sedges, and grasses. Hardwood and shrubby wetlands have more than 60% woody cover commonly dominated by alder, bigleaf maple, willows, or black cottonwood. The amount of woody vegetation is an important wildlife habitat characteristic. (See Riparian in this section.)

The north half of the Forest has a distinctly different distribution of conifer species from that south of the McKenzie River. (See Figure III-G-2.) At the south end of the Forest, species representative of the Sierran mixed conifer zone (Franklin and Dyrness 1973) become common. Most species shifts relate to precipitation and temperature patterns. For example, vegetation of the Oakridge and Rigdon Ranger Districts reflects significantly drier climatic conditions than those farther north. The Pacific silver fir series is not as widespread on these Districts and is often replaced by grand fir and Douglas-fir series on south-facing slopes. Alaska cedar is restricted to high elevation cirques and cold air drainage areas at the south end of the Forest but is more widespread on the Detroit Ranger District.

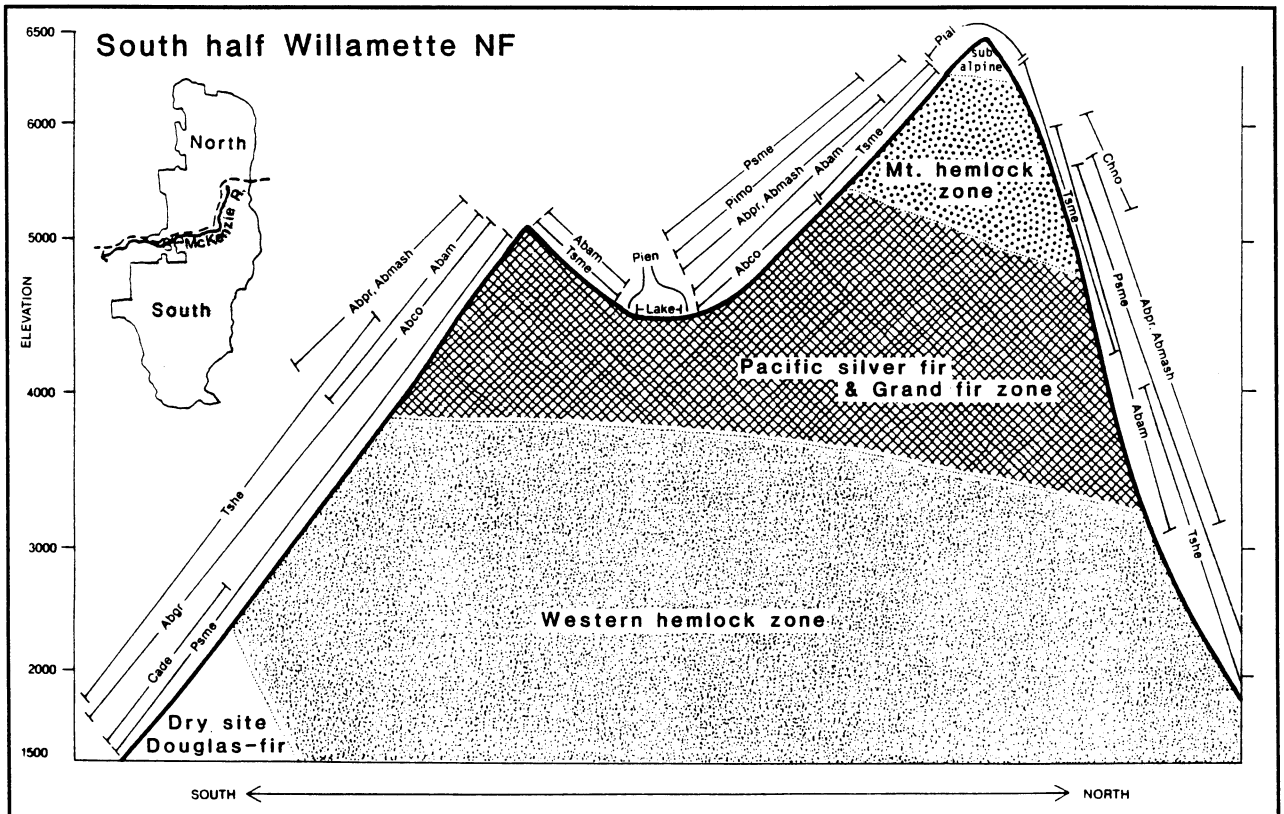
Figure III-G-2. North/South Vegetation Variation



Distribution of important conifers on south-facing and north-facing slopes at different elevation

Codes	Scientific Name	Common Name	Codes	Scientific Name	Common Name
ABAM	Abies amabilis	Pacific silver fir	PIEN	Picea engelmanii	Engelmann spruce
ABCO	Abies concolor	White fir	PIMO	Pinus monticola	Western white pine
ABGR	Abies grandis	Grand fir	PSME	Pseudotsuga menziesii	Douglas-fir
ABPR	Abies procera	Noble fir	THPL	Thuja plicata	Western redcedar
CHNO	Chamaecyparis nootkatensis	Alaska cedar	TSHE	Tsuga heterophyiia	Western hemlock
PIAL	Pinus albicaulis	Whitebark pine	TSME	Tsuga mertensiana	Mountain Hemlock

Figure III-G-2 Cont. North/South Vegetation Variation



Distribution of important conifers on south-facing and north-facing slopes at different elevations

Codes	Scientific Name	Common Name	Codes	Scientific Name	Common Name
ABAM	Abies amabilis	Pacific silver fir	PIAL	Pinus albicaulis	Whitebark pine
ABMASH	Abies magnifica shastensis	Shasta red fir	PIEN	Picea engelmannii	Engelmann spruce
ABCO	Abies concolor	White fir	PIMO	Pinus monticola	Western white pine
ABGR	Abies grandis	Grand fir	PSME	Pseudotsuga menziesii	Douglas-fir
ABPR	Abies procera	Noble fir	TSHE	Tsuga heterophylla	Western hemlock
CADE	Calocedrus decurrens	Incense cedar	TSME	Tsuga mertensiana	Mountain hemlock
CHNO	Chamaecyparis nootkatensis	Alaska Cedar			

Disturbance, or lack of it, may be the determining factor in the development of a plant community toward climax but more often it affects the structure of that community. Wildfires started by lightning and trees blown down by severe isolated windstorms have always been a part of the natural cycle affecting the structure of plant communities on the Forest. Flooding, landslides, volcanic activity, and snow avalanches are other natural disturbances that have significant but more local impacts on plant community structure. Although such events may appear catastrophic at the time they occur, they too are a part of the natural cycle responsible for the plant communities that exist on otherwise undisturbed areas.

In Western Oregon, and on the Forest, the mix of plant communities and stand conditions within communities varies considerably, often over relatively short distances (Maser et al. 1981). Outside of designated Wilderness much of this variation results from timber production and harvest activities.

Human activities have created a mosaic of different aged vegetation and altered plant structure over vast acreages.

The structure of a plant community may be determined either by the physical growth characteristics or by the size and age of plant species making up the community. For example, a grassland plant community provides completely different habitats than does a Douglas-fir community in its mature stage, but the same forest community in the grass/forb condition with fully stocked Douglas-fir regeneration provides habitats very similar to the grass land plant community. Forest plant communities, when altered by timber management programs, exhibit a variety of stand conditions.

Stand condition is the size, density, and species composition of a plant community after disturbance and at various time intervals following the disturbance. The grass/forb stand condition follows clearcutting or intense wildfire; trees such as Douglas-fir, are only 1- to 5-years old. The open sapling/pole stand condition may have many of the same plant species as the grass/forb stand condition, but it has trees larger than 1 inch d.b.h. (diameter breast height) and less than 60% crown cover. (See Figure III-G-1) Also see Figure III-W-9, Tentatively Suited Acres by Size Class, for tree size classification.

The following descriptions of stand conditions and time intervals are based on conditions that normally develop after broadcast burning clearcut units. Modifications of these descriptions may be required when used with other silvicultural treatments or plant communities.

The grass/forb stand condition lasts 2 to 5 years and occasionally 10 years. After timber harvest and/or slash removal, a unit may be largely devoid of vegetation for the first growing season. Resident herbs and new plants quickly dominate the site and give the unit a grass-forb appearance. Invading pioneer species are often non-native plants. The spread and establishment of noxious weed species is often associated with activities which result in the exposure of mineral soil. Shrubs and trees that sprout or are planted are not yet dominant. Seeding for erosion control or forage production may alter the species composition typically found in this stage. The grass/forb stage may also be prolonged where seeding of preferred species occurs. Brush species that colonize disturbed areas from seed may also be reduced.

The shrub stand condition often lasts 3 to 10 years but may remain for 20 to 30 years if tree regeneration is delayed. Shrubs become the dominant vegetation, providing a different habitat type for wildlife. Tree regeneration may be common, but trees are generally less than 10 feet tall and provide less than 30% of the crown cover. Past management has included reducing competitive vegetation to allow conifers to grow. Some shrub species may be pruned to produce more browse during this period.

The open sapling/pole stand condition occurs when trees exceed 10 feet in height but still have less than 60% crown closure when they reach 1 inch d.b.h. A dominant shrub understory is common. This open sapling/pole condition is very different from closed sapling/pole where crown closure exceeds 60% at one inch d.b.h. or larger. The open sapling/pole stage may be bypassed if initial tree densities exceed 400 trees per acre. In addition, open sapling/pole can be the first stand condition after overstory removal in shelterwood regeneration. The grass/forb and shrub stand conditions may be bypassed because residual tree cover does not create adequate openings, and broadcast burning is rarely used to set succession back. Thus, little mineral soil is usually present for the establishment of herbaceous vegetation. On the other hand, the open sapling/pole stand condition can be maintained or created with thinning. Length of time in this condition depends on crown closure and subsequent stand treatment. It may last from 8 to 20 years.

Closed sapling/pole/sawtimber stand conditions have one item in common - very little ground vegetation because of a closed canopy. Tree crown closure will exceed 60% and often reaches 100%. Length of time in this stand condition can range from 40 to 100 years. The time is determined by rotation age

and thinning treatment. If stands are thinned and long rotations used, this stand condition can change to large sawtimber or eventually old-growth.

The large sawtimber stand condition is characterized by trees with an average d.b.h. of 21 inches or larger. Conifers usually exceed 100 feet in height, and crown closure is generally less than 100%, permitting the development of ground vegetation. With this stand condition under intensive timber management, diameters of trees may approach diameters of old-growth but the very large snags and high volumes of large down material characteristic of old-growth will be lacking. Natural large sawtimber stands can have nearly as much standing and down woody material as old-growth stands. Duration of this stand condition in managed forests is determined by rotation age and thinning treatments. If mortality and decay are regularly prevented by thinning, this condition lasts for many years; but such a stand will lack the snag component necessary for cavity nesters and the down woody material essential to long term soil productivity and habitat for many wildlife species.

Old-growth stand conditions are characterized by decadence of live trees, snags, down woody material, and replacement of some of the long-lived pioneer species such as Douglas-fir by climax species such as western hemlock. Stands often have two or more layers with large diameter overstory trees commonly older than 200 years. Crown closure is normally less than 100% (Franklin et al. 1981). This definition and reference is consistent with the Regional Guide and is presented in more detail under number three, Old-Growth, later in this section.

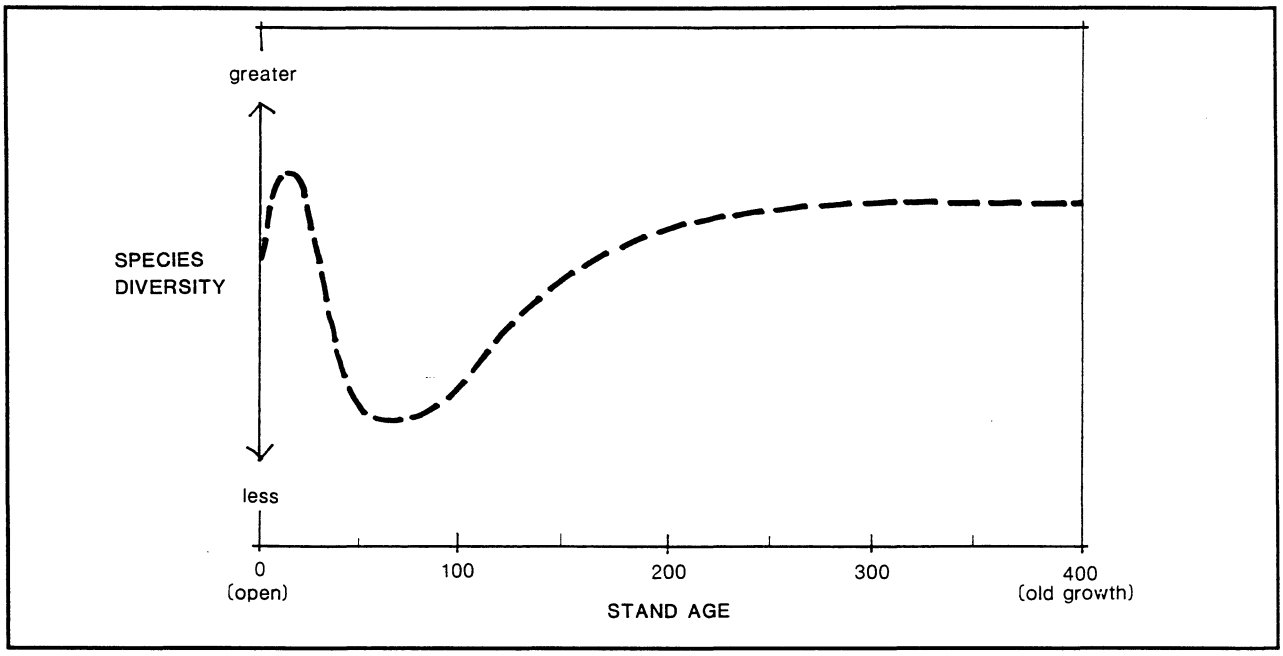
Shelterwood cutting generally does not generate the same kind of vegetative response as does clearcuting. A shelterwood is often designed to modify the microclimate of a site by retaining tree cover to enhance tree regeneration. This type of treatment is used more often in the Douglas-fir series where shading and seed fall are important to regeneration; and Pacific silver fir and mountain hemlock series where cold temperatures and soil are limiting. In some cases, advanced tree regeneration of climax species may comprise a majority of the seedlings. The shelterwood overstory is removed before the residual vegetation reaches the open sapling/pole stage, completely bypassing the grass/forb stage. As trees and vegetation grow and develop they display different characteristics. For example: between the open sapling/pole to the closed sapling/pole stage both plant and animal diversity sharply decrease; then as the trees and vegetation reach the large sawtimber and old-growth stages both plant and animal diversity again increase.

Vegetative Diversity

Diversity can be discussed in terms of richness (i.e., the variety of species) and evenness (i.e., the relative population levels of each species). In general, the early successional stages (grass/forbs) have the greatest diversity of plant species, but are dominated by a few species that are adapted to open conditions. The old-growth stands also have a variety of species present, but are dominated by species adapted to that environment. Stands of smaller trees around 50 years old have the least variety of species.

Figure III-G-3 shows the general relationship of species diversity and stand age. As a stand moves from an open condition into the grass/forb/shrub stage, there is an increase in the number of species. As shrubs and young trees begin to dominate, the canopy begins closing and blocks out the sunlight reaching the ground. This results in a fairly rapid decrease in the number of species as the less shade tolerant species die out. Management practices, such as commercial thinning, can mitigate this decrease by opening up the canopy and allowing more light to reach the ground. As a forested stands age and develop into the large mature tree stage, the canopy starts to open up. Diversity increases through this stage and then maintains a consistent, high level through the old-growth stage.

Figure III-G-3. Diversity by Stand Age (From Figure IV-4-1)



From a forest-wide standpoint, the greatest diversity would occur with a mix of old-growth and forest openings. This would provide habitat for species adapted to old-growth, and species adapted to all other stages, as well as those species that are adapted to the mixed environment of habitat block edges. The current Forest condition has about 36% of the forest in old-growth and mature stands of timber.

Riparian Zones

In the Forest, most riparian zones occur along streams and rivers. Riparian ecosystems, aquatic ecosystems, wetlands, lakeside zones, and floodplains will be jointly referred to as riparian zones. The terms "riparian zones" and "riparian areas" are used interchangeably in this chapter, but by strict ecological definition, they may not be the same in all instances. Figure III-G-4 displays the estimated acres of riparian habitat on the Forest.

Table T008. Riparian Habitat (III-G-4)

Stream Class [1]	Total (Miles/No.) [2]	Average Width (ft.)	Water Surface Area (ac.)	Riparian Width (ft.) [3]	Riparian Habitat (ac.)
I	426	42	2,168	400	20,650
II	940	14	1,595	200	22,800
III	1,295	[4]	[4]	200	31,400
IV	6,621	[4]	[4]	[5]	[5]
Lakes	270/391	--	11,233	150	4,910
Reservoirs	8	--	11,250	[5]	[5]
Wetlands [6]	--	--	--	--	23,950
TOTAL	--	--	26,246	--	103,710

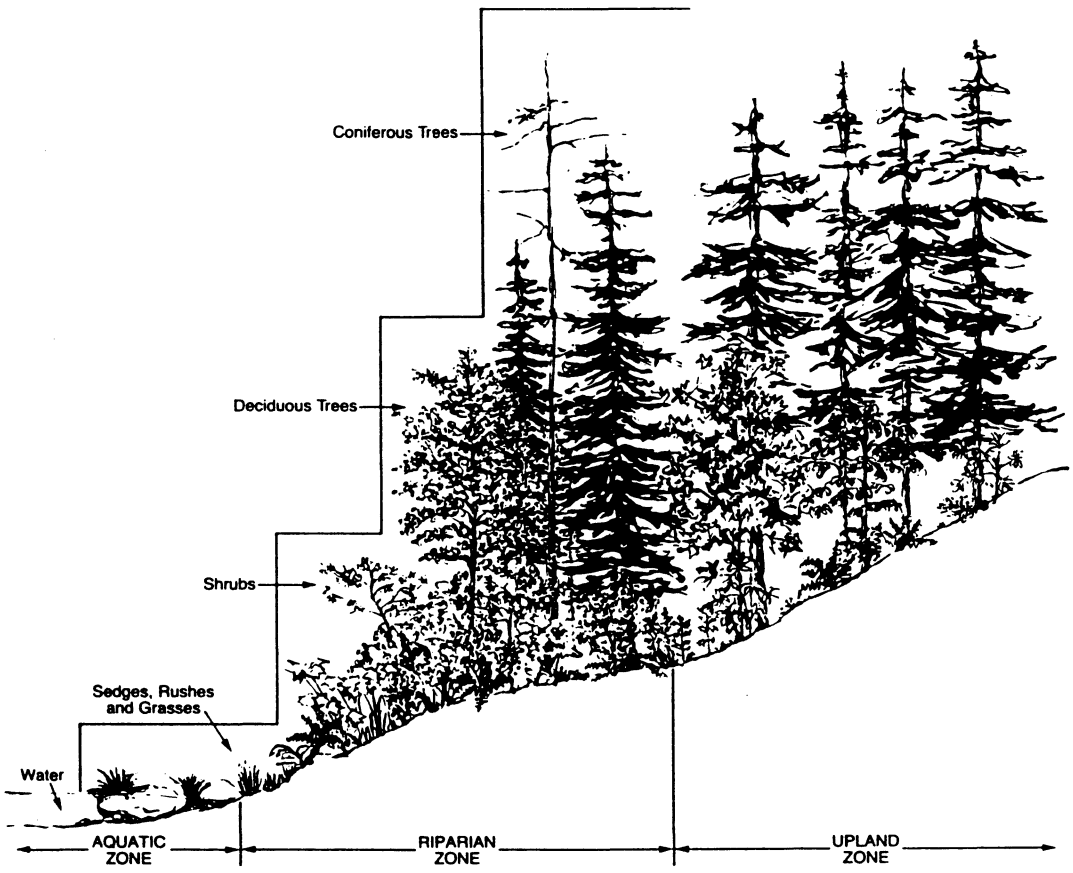
[1] Refer to Chapter III Water for Stream Class descriptions.
[2] Stream miles from FORPLAN data base. Lake length is for shoreline.
[3] Riparian widths were taken from the riparian area process paper, Land and Resource Management Planning, March 4, 1983.
[4] These streams are less than 5 feet in width on the average and no surface area was computed.
[5] Value not determined.
[6] Area of wetlands is taken from the Soil Resource Inventory (SRI) layer the Land and Resource Management Planning Data Base for Soil Resource Inventory, soil type 6.

There are five important elements that define the character and function of the riparian zones. They are topography, vegetation, surface water, soil, and local climate.

Topography often determines the space available for the development of riparian or wetland plant communities. It is a primary indicator of the type, frequency, and magnitude of erosion/deposition processes occurring in an area. It may have a major influence on local climate, particularly sunlight, temperature, and wind. Topography may strongly influence the occurrence and relative effect of various upslope disturbances such as wind-thrown trees, or landslides. Topography also determines the capability of the riparian zone to support many types of uses.

Figure III-G-5 illustrates the structure of riparian zone vegetation. In small streams on the Forest the dense riparian vegetation consists of deciduous shrubs and small trees and develops in 1 or 2 decades. Beyond that point in development, upslope conifers begin to overtop the deciduous streamside vegetation. Stands that are 50 to 150 years old have a dense canopy of deciduous trees with little understory vegetation. Older stands have a multilayered structure, and more light penetrates to the stream. Pioneer species include willows on gravel bars and red alder on mineral soil.

Figure III-G-5. Riparian Zone Vegetation



Riparian zones have vegetation that requires large amounts of free or unbound water and are transitional between aquatic and upland zones.

There is great variability in both the size and vegetative complexity of riparian zones because of the many possible combinations between stream gradient, elevation, soil, aspect, topography, water quantity and quality, type of stream bottom, and plant community (Campbell and Franklin 1979, Odum 1971, Swanson et al. 1981. Walters et al. 1980). Numerous habitats and niches occur within most riparian zones because of these varying conditions. Any of the plant communities found on the Forest can occur in riparian zones. The natural succession of vegetative types following major disturbances such as floods, fires, or logging, determines the kinds of vegetation occurring in a riparian zone at any given time.

Vegetation has numerous functions in riparian zones and wetlands. The number and type of wildlife habitats present in riparian zones are determined to a large degree by vegetative characteristics. For example, where riparian zones are dominated by deciduous vegetation, they provide one type of habitat in late fall and winter after leaf fall, and a different type of habitat during late spring and summer when in full leaf. Such species as the yellow-bellied sapsucker, downy woodpecker, ruffed grouse, and

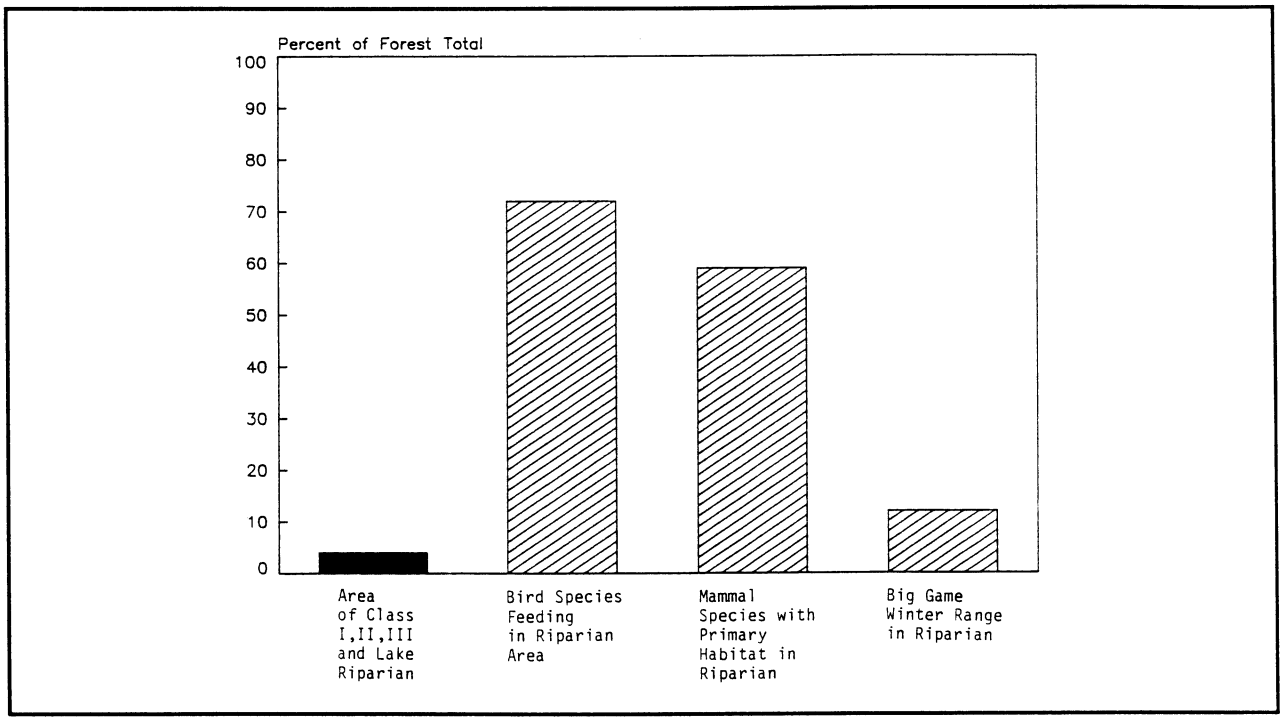
red-breasted nuthatch are highly dependent on deciduous riparian areas. Vegetation also stabilizes soil and streambanks and provides nutrients to the soil. On small to moderate-sized streams, leaves and debris (litter) provide the primary source of energy for the aquatic system (Franklin et al. 1981). Large dead and down trees store nutrients, provide seed beds for various tree species, provide habitat for various wildlife and, when incorporated into the stream, enhance channel stability (Franklin et al. 1981, Swanson et al. 1976). Large downed trees provide a stream a means to dissipate the water's energy; store needed sediment and spawning gravels for fish and, scour pools (Keller and Talley 1979). Large downed trees push floodwater on to adjacent floodplain areas, reducing the amount of damage to the stream channel. Large downed trees are the principal source of aquatic habitat diversity (Harmon et al. 1986). Productive fish habitats and good water quality depend on well-developed vegetative communities in riparian zones.

The presence of surface water during all or part of the year is a common characteristic of riparian zones and wetlands. The character of the surface water--whether standing (lakes, ponds, marshes, etc.) or running (streams and rivers), and whether perennial or intermittent--plays an important role in the function of these areas. The character of surface water directly controls the type of aquatic habitat, the composition and diversity of vegetation, and its potential use by wildlife, livestock, and people. Due to increased humidity, a higher rate of transpiration, shade, and greater air movement, riparian zones have different microclimates from surrounding coniferous forests. These conditions are preferred by some wildlife species, as well as by people, during hot weather.

Although riparian zones occupy only a small part of the overall area of the Willamette National Forest, they are a critical source of diversity within the forest ecosystem. The presence of multiple vegetation layers provides a variety of nesting sites, cover areas, and food sources associated with vertical diversity. Riparian areas often create distinct habitat zones within the drier surrounding areas. In addition, riparian zones are elongated (horizontal diversity) in shape with very high edge-to-area ratios (Odum 1979). They therefore possess a high degree of connection with other habitat types and function as effective transport systems for water, soil, plant seeds, and nutrients to downstream areas (Ewl 1979). Riparian zones also serve as important travel routes for the movement or dispersal of many wildlife species. Wildlife and livestock utilize vegetation in riparian zones more heavily than in other areas because they concentrate here for water, shade, and succulent forage. Figure III-G-6 displays the proportion of wildlife use in riparian areas.

Riparian zones are important for many other types of land use. Highly productive timber sites frequently occur along streams and around wetlands or lakes. Riparian zones are used for road locations, particularly in mountainous, rugged terrain. Rock and gravel for building roads have been taken from streambeds and their banks as well as from floodplains. Recreationists concentrate their use in wetland and riparian areas where scenic values are high. Up to 80% of the Forest's dispersed recreation use occurs in the riparian zone (Clark et al. 1984). Riparian zones are preferred for recreational developments such as campgrounds and summer home sites. Because of these conflicting uses, riparian zones are recognized as critical areas in multiple-use planning.

Figure III-G-6. Proportion of Wildlife Use in Riparian Areas

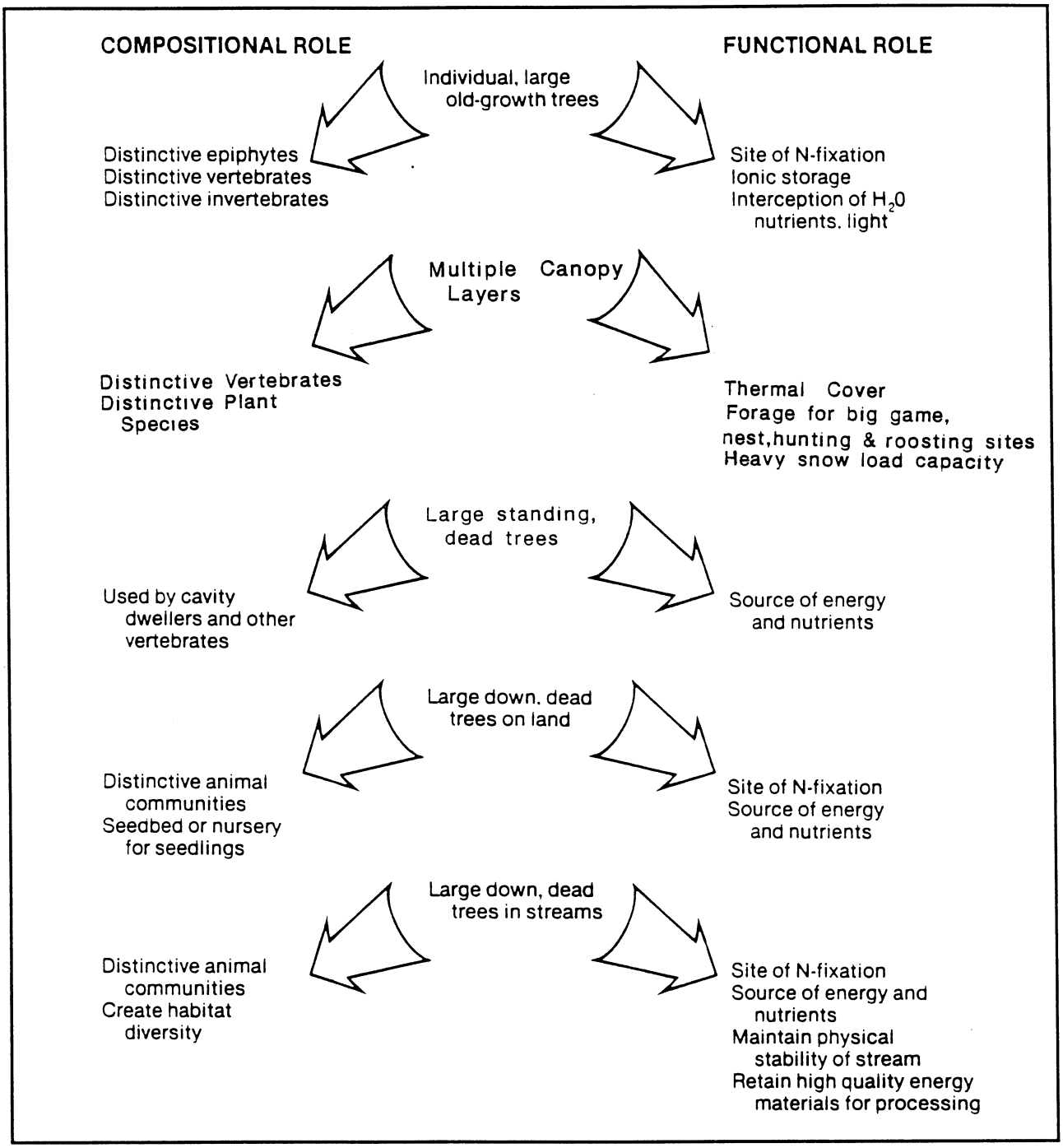


Old Growth

Each tree within an old-growth stand plays a progression of roles, from the time it matures until the tree becomes a decaying contributor to the forest floor. Examination of the data from the 1988 Mature and Over Mature Survey (MOMS) indicates that about 594,800 acres of the Forest are covered by old-growth under the Regional Guide definition. This accounts for 36% of the total Forest. Of the total acres of old-growth trees, 78% is in the low elevation Douglas-fir type and the remaining 22% is split among the three high elevation types as follows: Douglas-fir/true fir and true fir combines for about 16%; and mountain hemlock equals 6%.

Five structural components are of key importance in an old-growth stand. These are the individual, live, old-growth trees; the multilayered understory of younger trees; the large, standing dead trees or snags; the large, dead, down trunks or logs on the land; and those that are a part of the stream ecosystem. It is these structural features that are unique to an old-growth forest ecosystem, setting it apart from young growth and, especially from managed stands. Most of the unique or distinctive compositional and functional features of old-growth forests can be related to these structural features. (See Figure III-G-7.) These structural components make possible much of the uniqueness of the old-growth forest in terms of flora and fauna (composition) and the way in which energy and nutrients are cycled (function).

Figure III-G-7. Structural Components of Old-Growth



The old-growth ecosystems are represented mostly in the western hemlock series and the Pacific silver fir series. The Douglas-fir old-growth stand is the intermediate stage of the western hemlock series and is the most common form of old growth on the Forest. It is defined by the Regional Guide, R-6 (1984) as any stand generally containing the following characteristics:

1. Two or more species with several age classes.

2. Five or more overmature trees per acre, with at least some Douglas-fir that are bigger than 32 inches in diameter.

3. Stands will usually contain a multi-layered canopy.

4. Two or more conifer snags per acre.

7. Thirty or more tons per acre of down logs.

In addition to stand characteristics, there are other forest characteristics that affect the quality of old growth. Old growth values vary with stand size. Large, contiguous blocks will have core areas that are not affected by edge effects and serve as higher quality old growth habitat. These stands will contain a higher diversity of old growth typical species and will be less susceptible to catastrophic events like blowdown. Small, isolated clusters of old growth serve as important gene pools and seed sources that are site specific. They may also serve as valuable "stepping stones" for wildlife species dispersing from other old growth blocks.

Fragmentation is the increasing amount of edge, loss of contiguity and increasing isolation of habitat patches following disturbance. With old growth this is shown by the number of isolated blocks, the amount of edge/total area within individual blocks and the distance between blocks. Wilderness and roadless areas tend to be less fragmented than general forest, due to limits in logging activities, however the smaller, high elevation timber types found in many wilderness areas on the Forest may be highly fragmented by terrain, extreme weather conditions and other natural disturbances.

A third forest characteristic that directly affects old growth is isolation. This involves the distance between patches and the condition of the intervening stands. Landscape patterns that result in "stepping stones" and corridors minimize isolation. This is important for genetic interchange, wildlife dispersal and movement and increased habitat diversity at the local level.

Large organic debris from old-growth forests has a major influence on the physical characteristics of the small stream (Class IV see Water) systems. Large accumulations of woody debris have resulted in complex aquatic environments of riffles, pools, runs, glides, and side channels. The debris has added stability to stream channels and retarded the rate of downstream flow.

In Class III streams (see Water) large woody debris is common and may cover from less than 25% up to 50% of the channel area. The canopy in the undisturbed state provides continuous shading. Energy of water flowing in the channel is continually dissipated by woody material and vegetation, reducing erosion and leading to deposition of organic and inorganic material. As streams get larger, there is less direct influence of old-growth (Franklin 1981).

Optimum wildlife habitat in old-growth stands as described by Franklin et al. (1981), specifically requires a component of pioneer Douglas-fir mixed with western hemlock. The old-growth Douglas-fir has crown and bark characteristics quite different from western hemlock. These features of Douglas-fir are highly significant as habitat for certain wildlife species (see Wildlife) such as bats and the western red-backed vole.

Harvesting of old-growth stands has been of major importance to the timber industry in the Pacific Northwest for several decades. The challenge of yarding these large logs over steep, mountainous terrain while protecting the other resources like soil and water, has resulted in technological advances

such as long span skyline, balloon and helicopter logging systems. The high value of the old-growth wood makes it feasible to use these expensive systems.

Recreation users of the Forest enjoy old-growth stands of trees for many different reasons. The old trees are aesthetically pleasing and provide a living connection with the past and a visual reference to the natural successional processes of the forest environment. Many people feel that the massive, towering trees in some old-growth stands have a cathedral quality and are spiritually uplifting and inspirational. These stands provide a feeling of solitude and escape from the evidence of human presence. Old-growth stands are also important as a gene pool, conserving the diversity of characteristics which insures the survival of the species against attacks by insects and disease. These stands are also valuable for conducting research on the undisturbed organisms and processes of the forest ecosystem.

Threatened, Endangered, And Sensitive Plants

The 1989 Federal Register Notice of Review does not list any Federally listed Threatened or Endangered plants on the Forest. The Regional Forester has identified 13 documented and 10 suspected plant species on the Forest which are considered sensitive. This list was developed from Oregon Rare and Endangered Plant Program Task Force (OREPPT). An organization ofprofessional (University teachers, Federal and State agency) and lay people (taxonomists and botanists) knowledgeable of the status of the various plant species in Oregon and adjacent areas. The task force has the support of the Native Plant Society of Oregon (NPSO) members (200+). Plant inventory data from public and private land managers is shared with NPSO and Oregon Natural Heritage Data Base (ONHDB) recommendations. The information system that contains plant inventory data from OREPPT.

The Endangered Species Act of 1973 as amended (1978, 1979, 1982) declares that "...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."

Prior to 1973 there was an awareness of the need to protect endangered plants when management activities were proposed or implemented. Since 1973 the U.S. Department of Agriculture--Forest Service has established policies to carry out broad responsibilities under the Act through directing the development of management strategies to prevent species from becoming endangered. Such "sensitive species," although not subject to the Act, received special management emphasis to ensure their continued viability and preclude trends toward endangerment which would result in the need for Federal listing. This emphasis eventually resulted in the current USDA Forest Service - Region 6 Sensitive Plant List.

"Sensitive" species are those plant species identified for which viability is a concern. This is evidenced by a significant current or predicted downward trend in population numbers or density. Viability concerns are also indicated by significant current or predicted downward trends in habitat capability that could reduce a species' existing distribution.

The 1989 USDA Forest Service - Region 6 Sensitive Plant List identifies 23 species that are or could be found on the Forest. Typically, those plants are associated with certain types of habitat. The four main habitats usually account for most of the listed plants. These are 1.) bogs and wet/moist areas, 2.) moist, rocky sites, 3.) dry rocky sites, usually ridge tops, and open slopes, fields, meadows. Field inventories are required on proposed activity areas to determine if the plants are actually there. If found, then a determination needs to be made as to the extent of the population and the area occupied, so as to determine the impacts on the plant if the activity should occur and the mitigation necessary to avoid conflict.

Both natural events and human activities can affect a species' viability. Natural causes include catestrophic events and normal succession. Human activities that commonly occur on the Forest include timber harvest, commercial and scientific plant collection, recreation and livestock grazing. Road building and off road vehicle use can impact TE&S plants directly, through habitat loss, or indirectly, by potentially introducing competitive species or noxious weeds to sites that would otherwise have been isolated. Many of these activities are concentrated in specialized habitats such as riparian zones, rock faces or natural meadows. In many cases the TE&S species are uncommon because they are adapted to these unique environments and are habitat limited. This concentrates them in the same sites that concentrate human activities, greatly increasing the potential for conflict.

It should be noted that the effect of both natural and human activity on the species can be positive as well as negative. A few species are disturbance dependant, requiring fire, soil disturbance, increased light or some other alteration in the environment to reproduce or survive. The disturbance may revert the site to an earlier successional stage that is more suitable to the plant's survival. Species that are affected in this manner are responsive to habitat enhancement to improve their survival.

A current list of sensitive species is available in the planning records at the Supervisor's Office, Eugene, Oregon. This list is updated annually. Those plant species listed in the 1989 USDA Forest Service - Region 6 Sensitive Plant List, documented on the Forest, are shown in Figure III-G-8.

No evaluation has been made of impacts to Threatened, Endangered, and Sensitive (TE&S) plants caused by Forest Service programs and activities prior to the 1973 Act.

Table T___. Threatened, Endangered or Sensitive Plants (III-G-8)

Species	Designation	Forest Occurrence
Aster gormanii	Threatened Oregon R-6 sensitive	14 sites identified in the last 10 years
Calamagrostis breweri	Threatened Oregon R-6 sensitive	1 known site
Draba aureola	Oregon and R-6 sensitive	2 sites identified in the last 10 years
Frasera umpquaensis	Federal candidate Category 2 Oregon and R-6 sensitive	3 known sites
Gentiana newberryi	Threatened Oregon R-6 sensitive	1 known site
Hieracium bolanderi	Threatened Oregon R-6 sensitive	1 known site
Lycopodium annotinum	Threatened Oregon R-6 sensitive	1 site in last 10 years
Lycopodium inundatum	Threatened Oregon R-6 sensitive	1 known site
Montia diffusa	Oregon and R-6 sensitive	Numerous sites in Shady Beach fire area
Ophioglossum vulgatum L.	Endangered Oregon R-6 sensitive	3 known sites
Polystichum californicum	Threatened Oregon R-6 sensitive	1 known site
Romanzoffia thompsonii	Oregon and R-6 sensitive	21 sites in last 10 years

FIRE

Fire has played a key role in the development of forest ecosystems in the Western Cascades. Fires influence many segments of the physical and biological forest environment including plant species and communities; insects, parasites, and fungi; and even wildlife habitat patterns and populations. Fires also affect major ecosystems processes and characteristics such as nutrient recycling, energy flow, succession, diversity, productivity, and stability. Factors such as fire frequency, duration, intensity and size all have a bearing on these fire effects.

Historical Trends

At low elevations, most of the Forest was burned by large, lightning-caused fires between 120 and 450 years ago. Catastrophic fire intervals in the upper elevations, including the Pacific silver fir zone, may have been over 500 years apart. Over time, these fires have maintained the Douglas-fir vegetation characteristic of the west side of the Cascades.

Little is known about fires caused by native Indians, but as trappers and settlers moved through the Cascades in the mid-1800's, some fires were intentionally set, and some resulted from campfires left burning, causing an increase in fire frequency. Since the early 1900s fire suppression efforts have affected fire occurrence patterns and, in particular, potential large stand-replacement fires have generally been suppressed at a smaller size. Since 1950, out of more than 2,500 fires, there have been only 12 fires larger than 300 acres; of these, 7 were started by lightning and 5 were human caused.

Fire occurrence on the Forest is characterized by "peaks and valleys", with frequent periods of low fire occurrence and occasional periods of extremely high occurrence. Lightning fire occurrence is far more cyclic here than it is in eastern Oregon. The majority of fires on the Forest are fires of low to moderate intensity and are suppressed at a small size. During the last 30 years, the most lightning fires (316 fires) occurred in 1967 and the fewest number (0 fires) occurred in 1954 and 1988. In the same time period, human-caused fires accounted for 48% of the fires and 45% of the acreage burned. A majority of the human-caused fires have resulted from recreation related fires, e.g., campfires and smoking. The most costly and damaging human-caused fires have occurred from debris burning, industrial operations, and railroad related activities.

Some fire related ecosystem processes have been duplicated and others changed by timber management activities on the Forest. As mature and old-growth stands have been harvested, the timber has been removed from the site, and the remaining slash has been burned. These activities have created a divided mosaic of clearings and older stands. Prescribed fires of low to moderate intensity have changed soil, watershed, and vegetation characteristics less drastically than catastrophic wildfire. Generally, there have been smaller areas burned and, except for short-term slash accumulation during harvest, there has been a reduction of overall forest flammability.

Historically, prescribed burning has been the most common tool used for the reduction of logging residues and natural dead and down debris, and the preparation of sites for reforestation. In the past when prescribed burning was done primarily in the autumn, it was difficult to control fire intensity and duration. Spring and summer burning have increased flexibility to use low to moderate intensity fires to control fire effects and meet resource objectives.

Costs of prescribed burning have risen sharply. Logging is now occurring on steeper ground that cannot be machine piled and burned in winter months when mopup and patrol are not critical. Mop-up and patrol costs in the dryer summer season are much higher than those experienced during the early

spring and late fall when heavy rain aids with mopup efforts. Small, irregular shaped harvest units and the increasing need to meet air quality constraints have also contributed to increased prescribed burning costs.

Current Situation

On the Forest, all fires are suppressed, with an emphasis on the most cost effective suppression response. All fires that escape initial attack are evaluated to determine the strategies that would provide for the least cost for suppression plus the least damage to forest resources.

A wide variety of techniques and practices are currently used to minimize resource loss and suppression costs from debris burning, industrial operation and railroad fires. The Forest maintains three primary and three emergency lookouts, in addition, fire patrol planes are used during the fire season. Due to the extensive road system and sophisticated communication systems now in use, Forest visitors, contractors and permittees are also a significant part of the total detection system. While an increase in use of the Forest setting increases the risk of human caused fires, increased use also contributes to early detection and, in some cases, suppression of small fires.

Prescribed burning is scheduled to avoid smoke intrusions into smoke sensitive areas and to minimize air quality impacts during summer holidays and high use periods, and the State Forester's Office, Oregon Department of Forestry coordinates all forest and agricultural burning in western Oregon. As a result, efforts to maintain air quality have also increased the complexity of prescribed burning on the Forest. For additional information see Chapter III, Air.

On a limited basis, prescribed fire is being reintroduced to both natural and historic meadows on the Forest. Although early settlers managed historic meadows such as Mutton Meadow and Rigdon Meadow with fire, aggressive fire suppression has generally excluded fires from these meadows in recent years. The elimination of fire has caused an encroachment of trees, the loss of natural meadow ecology, and the loss of forage palatability. Prescribed fire can also be used to improve the forage for deer and elk. Fire eliminates old unpalatable forage and in turn adds nutrients to the soil. As a consequence, the new succulent growth is more nutritious.

Future Trends

Both natural and activity fuels need to be managed over time to meet long-term resource management objectives. Regeneration harvest of old-growth timber provides unique opportunities and challenges to establish essential fuel profiles that balance resource objectives such as utilization, hazard reduction, site preparation, and the maintenance of site productivity. In addition, fuel treatments for the improvement of wildlife habitat, the reduction of natural residues on Wilderness and nonwilderness lands, and the reintroduction of fire to Forest ecosystems may increase if treatments are found to be cost effective and funds are available.

Expected increases in public use of the Forest will provide additional opportunities for public contact. To maintain the low levels of human-caused fire incidents fire prevention, cooperative fire prevention efforts with local fire departments and the Oregon State Department of Forestry (OSDF) will continue.

FISH

The fish of the Forest are a diverse number of species adapted to a variety of habitats. Of the 30 species found on the Forest, most are native to the natural streams and lakes of the western slope of the Cascades. A native species is one which has always occurred here, reproducing on its own. Additionally, several species have become naturalized, primarily in lakes and reservoirs. A naturalized species is one that was introduced from other parts of the country or world and has been able to reproduce on its own.

Several native and naturalized species are artificially propagated to meet a variety of fish management objectives. By far the most abundant group is in the Salmonidae family. Fish in this family include anadromous, as well as resident species, and native, as well as naturalized species.

The spring chinook, winter steelhead, and summer steelhead are the most important anadromous species. Anadromous fish spawn and grow to smolt size in forest streams before migrating to the Pacific Ocean where they grow to adulthood. Smolts are juvenile salmon or trout who have undergone physiological changes allowing them to adjust to increased salinity of ocean water. These fish then return to their natal river to rest prior to spawning and completion of their life cycle.

Rainbow, cutthroat, and bull trout (formerly known as the dolly varden) are the most abundant native species of resident trout. Brook trout have been widely distributed in the new Cascade lakes and have naturalized in many areas.

Several salmonid species have limited distribution on the Forest. Native bull trout populations exist only in the upper McKenzie River drainage above Leaburg and in the South Fork McKenzie above Cougar Dam. Although brown trout have not been stocked for many years, naturalized populations persist in Leone and Linton lakes. The population of cutthroat trout found in the Hackleman Creek drainage currently receives special protection while fish systematists compare it to other stocks of cutthroat. Its long period of isolation, caused by lava flows 8,500 years ago, provides an excellent opportunity to study genetic differences caused by isolation.

Several species of resident fish, such as white and black crappie, largemouth bass, and brown bullhead are naturalized warm water game fish that support significant recreational fisheries in reservoirs. Many of the native species such as northern squawfish, largescale sucker, chiselmouth, and a variety of sculpins are either predators on or competition for salmonids. Others, such as redside shiner, brook lamprey, and several species of dace are prey species utilized by various game fish species. The Pacific lamprey is the lone anadromous nongame fish.

The Oregon chub (*Oregonicthys crameri*) is an unusual fish with small, isolated water populations. This 2- to 3-inch long minnow inhabits slough-like tributaries with extensive cover of aquatic plants and woody debris. In the past, the species has been recorded at many locations in the Willamette River Drainages, but its range has dwindled. It is presently found on the Forest at three locations. Because the entire population exists in a 1.5 mile long zone of the Willamette River, it is being proposed for listing as a threatened or endanger species.

The Bull trout is on the Regional Forester's sensitive species list as a consequence of it being on the U.S. Fish and Wildlife Service category-two list for species to be considered for threatened status. It's only known locations on the Forest presently are in the McKenzie River system above the Leaburg dam and in the South Fork of the McKenzie River above Cougar dam. Its presence is suspected in the

Middle Fork of the Willamette River above Hills Creek Reservoir where it was known to exist prior to 1968.

Another species of concern is a unique race of native cutthroat trout (*Oncorhnychus Clarki*). This race of cutthroat trout populates Hackleman Creek year around and when Fish Lake is full of water in the winter and spring the trout occupy the lake as well. To protect this race of trout, the ODFW has ruled that fishing in the creek is not allowed.

The fish habitat available on the Forest includes about 3,400 acres (1,292 miles) of lotic (flowing water) and 22,480 acres of lentic (lake and reservoir) environment (Figure III-I-1). Most of the fish producing streams and reservoirs are located at lower elevations while the natural lake habitat is located in the High Cascades.

This Forest offers diverse settings, species and opportunities for fishing. Opportunities range from fishing by boat or from the shore in reservoirs to hike-in fishing with bait in Wilderness lakes to fly fishing in large rivers such as the McKenzie or Willamette. When converted to dollar value of the commercial catch and sportfishing days, the Forest fish resources are worth an estimated 4.9 million dollars annually.

Fish produced on the Forest contribute to the commercial and sportfisheries both on and off Forest. Spring chinook and both summer and winter steelhead support sport fisheries in the major tributaries draining the Forest and in the lower Willamette River. Spring chinook contribute to the off-shore fisheries of the Pacific Ocean from southeast Alaska to northern California and are a major part of the the lower Columbia River gillnet fishery.

Management of the Forest's fishery resources is a shared responsibility between the Forest and Oregon Department of Fish and Wildlife. The State is responsible for setting seasons and manipulating the populations either through stocking or restrictive gear regulations. The Forest is responsible for maintenance of existing habitat, improving or expanding habitat, and for investigating fish/habitat relationships. The intricate relationships between the animals and the habitat requires continual interagency contact and coordination. Beyond the National Forest boundaries the Oregon Department of Fish and Wildlife assumes the additional responsibility for habitat, and also deals with downstream migrant passage at hydropower facilities.

Table III-I-1. Amount of Fish Habitat

River Drainage	Anadromous Fish Streams		Resident Fish Streams		Natural Lakes	Reservoirs
	Acres	Acres	Miles	Acres	Acres	Acres
Little North Santiam River	6.2	22.8	27.6	75.1	--	--
North Santiam River	0	0	104.0	267.1	--	3,580
Wilderness Streams	0	0	17.5	45.9	--	--
Breitenbush River	0	0	58.4	184.5	--	--
DETROIT RANGER DISTRICT TOTAL	6.2	22.8	207.5	572.6	964	3,580
Quartzville Creek	10.0	37.8	30.0	79.9	--	--
Middle Santiam River	8.2	33.6	30.4	107.9	--	--
South Santiam, Wiley, Calapooia	20.5	73.6	56.1	155.2	--	--
Lava, McKenzie, North Santiam	0	0	19.9	41.8	--	--
SWEET HOME RANGER DISTRICT TOTAL	38.7	145.0	136.4	384.8	80	0
Blue River, Gate Creek	1.5	3.0	45.1	196.8	--	1,420
South Fork McKenzie, Quartz Creek	6.2	22.3	67.5	184.4	--	1,280
Wilderness Streams	0	0	23.4	62.8	--	--
BLUE RIVER RANGER DISTRICT TOTAL	7.7	25.	136.0	444.0	40	2,700
McKenzie River, Horse Creek	46.8	114.0	87.1	207.6	--	320
Wilderness Streams	2.2	4.4	18.7	41.6	--	--
McKENZIE RANGER DISTRICT TOTAL	29.0	118.4	105.8	249.1	1,945	320
Fall Creek	29.0	103.4	96.8	249.1	--	--
Winberry Creek	6.6	24.9	26.9	63.3	--	--
Middle Fork Willamette River	0	0	54.5	133.7	--	1,940
LOWELL RANGER DISTRICT TOTAL	35.6	128.3	178.2	446.1	0	1,940
Salt Creek	0	0	53.3	115.9	--	--
Salmon Creek	0	0	71.7	126.1	--	--
North Fork Middle Fork Willamette	0	0	120.3	221.7	--	--
OAKRIDGE RANGER DISTRICT TOTAL	0	0	245.3	463.7	7,912	--
Hills Creek	0	0	29.1	74.8	--	300
Middle Fork Willamette	0	0	122.7	322.3	--	2,410
RIGDON RANGER DISTRICT TOTAL	0	0	151.8	397.1	292	2,710
FOREST TOTAL	137.2	439.8	1,161.0	2,957.5	11,233	11,250

Historic Trends

Fish habitat on the Forest has undergone significant modifications in the last 4 decades. In the 1950s and 1960s, construction of flood control and hydropower reservoirs isolated approximately 257 miles (925 surface acres) (see Figure III-I-2) of anadromous fish habitat and impaired the productivity of an additional 75 miles (273 surface acres). A total of 11,250 additional surface acres of reservoir water also became available for management of warm and cold water resident species as a consequence of dam construction. There are approximately 119 miles of streams on the Forest which currently produce one or more species of anadromous salmonids. An additional 18.2 miles of anadromous fish habitat exists above Foster and Green Peter Dams on the South Santiam River. This habitat is currently not

being utilized due to fish passage problems over the dams and the possibility of introducing diseased hatchery stock. Current anadromous habitat is about one-third of the historic level.

Fish hatcheries have been established on every major river system draining the Forest, either to mitigate for fish populations damaged by the flood control reservoirs, or to augment the natural productivity of the existing fish habitat. There are seven hatcheries that use water from rivers draining Forest lands. Hatcheries at Marion Forks (North Santiam), Foster (South Santiam), Leaburg (McKenzie) and Oakridge (Willamette) were established specifically to mitigate impacts on downstream migrations of smolt salmon and steelhead. Marion Forks Hatchery near Idanha and Willamette Hatchery at Oakridge are located on the Forest under a special use permit to the United States Army Corps of Engineers who, in turn, contract with Oregon Department of Fish and Wildlife (ODFW) for operation of the facilities.

A significant storm in late 1964 caused heavy degradation of fish habitat in several major resident trout streams, such as Salmon Creek and Middle Fork Willamette River. After undergoing a prolonged period of restabilization, these habitats are now in a recovery mode and should continue to improve. See Chapter III, Water for a detailed discussion of flood events.

The 1950s and 1960s were also decades in which considerable stream habitat for anadromous and resident fish was degraded by road construction and logging practices that increased erosion and removed streambank vegetation. This activity continued into the 1970s, although at a lesser rate. By the end of that decade, approximately 1,075 miles of streams (24%) were adjacent to clearcut units and an additional 238 miles were within 100 feet of a road (Stewart and Skeesick 1981). Culvert installations occasionally isolated spawning habitat for resident trout and prevented juveniles from reaching protected winter habitat.

The late 1970s and early 1980s were periods of increasing awareness of fishery values and need for improved protection of fish habitat. Streamside management unit prescriptions, improved logging methods, better road locations, and improved erosion control techniques significantly reduced the impact of land management activities. By the mid-1980s actual fish habitat improvement projects were being implemented to mitigate previous impacts and to capitalize on the inherent productive capabilities of the various aquatic habitats.

Populations of anadromous fish and resident fish have followed distinctly different trends during the last several decades. Since 1950, the native anadromous fish populations have decreased significantly and have largely been replaced by fish released from the hatcheries. Smolt mortalities associated with Fall Creek Dam, Eugene Water and Electric Board diversions on the McKenzie River, and Foster Dam on the South Santiam River have decreased those stocks considerably. The summer steelhead stocks introduced by the ODFW have become naturalized in the McKenzie River system. The wild smolts in conjunction with continued hatchery liberations have generated an excellent population of summer steelhead using the McKenzie River and its major tributaries.

The overall supply of native resident cold water fish is not known to have changed significantly over time even though populations inhabiting several major streams may have been depressed as a result of the 1964 flood or other habitat distresses. There is some indication that bull trout may now inhabit fewer areas than they did previously.

Fish stocking by the State (Fish Commission) began as early as 1912 in Linton Lake and others. During 1913, the Oregon Fish Commission stocked several lakes with eastern brook trout. To help sustain the relatively intense fisheries on moderate to large rivers, the ODFW has developed a large-scale program of stocking fishing streams with legal-sized fish. Concurrently, they stocked the reservoirs and selected road accessed lakes with both legal-sized and fingerling trout and salmon. Less accessible lakes were

stocked with fingerling trout, first by pack horse, then by fixed-wing aircraft, and more recently by helicopter.

Warm-water fish were introduced into Detroit, Hills Creek, and Lookout Point reservoirs by unauthorized parties; and, brown bullhead, largemouth bass, white crappie, and black crappie naturalized. The white crappie population in Hills Creek Reservoir expanded rapidly and by the late 1970s was supporting a very active spring fishery.

Table III-I-2. Anadromous Fish Habitat

River System	Current Anadromous Habitat (miles)	Lost Anadromous Habitat (miles)
Little North Santiam	6.2	0
North Santiam	0	35.7
South Santiam	20.5	18.2
McKenzie	56.7	70.1
Fall Creek	35.6	0
Middle Fork Willamette	0	133.3
TOTAL	119.0	257.3

Current Situation

Important fish species on the Forest include those belonging to the family Salmonidae. These include the native species of spring chinook, winter steelhead, rainbow trout, cutthroat trout, bull trout, and mountain whitefish as well as the introduced species of summer steelhead, brook trout, brown trout, and sockeye salmon that have become naturalized. These species support major recreational fisheries on the Forest and contribute significantly to sport and commercial fisheries in the Pacific Ocean, lower Columbia River, and lower Willamette rivers. The current smolt population on the Forest is estimated at 169,000 fish. Anadromous fish spawning population levels are reasonably well documented (Figure III-I-3).

No estimates of abundance of resident cold-water fish have been attempted because of the variability of the productivity of the various habitats and the dependence of many of the water bodies upon regular stocking to maintain population abundance.

The premier fisheries supported by fish produced on the Forest are for spring chinook and summer steelhead. The primary spring chinook harvest occurs in the lower Willamette River between St. Helens and Oregon City. Fish reared in the Santiam, McKenzie, and Middle Fork Willamette subbasins account for 80% of the average 15,000 fish catch. In addition, the lower Columbia River gillnet fishery harvests an additional 8,000 of these, the highest quality of all the salmon stocks.

The summer steelhead stocks are a recent phenomenon based upon proper stock selection and hatchery technology implemented in the 1970s. Adults returning from hatchery releases and natural production support major fisheries in the Santiam, McKenzie, and Middle Fork Willamette rivers just below the Forest boundaries. These fisheries are gaining in popularity as more people learn the proper angling methods and preferred locations to fish.

The stream fishery for resident trout is supported primarily by wild native cutthroat and rainbow trout. The cutthroat are the main contributors in the small tributaries and head water streams while the rainbow are the major target in moderate to larger sized streams. Hatchery augmentation of trout populations in streams has gradually been reduced and is now limited to a few intensively fished areas where the catch rate justifies the high cost. Special fly-fishing only regulations on North Fork of the Middle Fork Willamette River provides a unique opportunity to fish for native rainbow and cutthroat trout at high population levels.

Table III-I-3. Approximate Current Anadromous Fish Spawning Populations [1]

Drainages	Spring Chinook	Summer Steelhead	Winter Steelhead	Coho Salmon
Little North Santiam River[2]	50	30	50	10
South Santiam River[2]	0	0	300	0
McKenzie River	2,350 [3]	1,000 [3]	0	2
Fall Creek	0	0	250 [4]	0
FOREST TOTAL	2,400	1,030	600	12

[1] Excluding Hatchery Stock.
[2] In USFS Ownership.
[3] Leeburg Dam Counts.
[4] Fall Creek Dam Counts.

Presently, nearly half of the watersheds in the Forest exhibit high sediment yields, as compared to natural levels, and are considered indicators of lower water quality. Sediment that is significantly elevated above natural levels can reduce fish habitat quantity and quality.

In the recent past, acknowledgment of the importance of providing and retaining large woody debris in streams has resulted in a diversified as well as a reasonably stable condition for fishery habitat Forest-wide. Specifically, attempts to return Fall Creek tributaries to a more natural condition by the addition of in-stream rock and log structures has been accomplished. Initial evaluation suggest efforts have had significant beneficial effects for fish populations.

There are approximately 390 natural lakes with trout populations on the Willamette National Forest. These range from Waldo Lake at 6,410 surface acres down to 2 acres in size. Most of the total acreage (10,924) of lakes on the Forest is located in the High Cascades where stream drainages are poorly developed. Consequently, few of the lakes have natural spawning areas available. Approximately 90% of the lakes are regularly stocked with fingerlings by the Oregon Department of Fish and Wildlife (ODFW) to capitalize upon the productive capacity and to support the recreational opportunities associated with the lakes. ODFW stocks lakes one acre or larger in size. Recently helicopters have been used to improve the reliability of stocking fingerlings in small lakes. However, financial limitations have caused significant interruptions to the program in recent years. Helicopter stocking of remote lakes is normally conducted every other year. The majority of the lakes are stocked with fingerling brook trout with rainbow planted in most of the rest. Cutthroat trout receive limited distribution because of a lack of stocks adapted to lentic environments. West slope cuttroat trout are being stocked experimentally with some success.

Flood control and hydropower reservoirs on the Forest have created 11,250 acres of fish habitat when at full pool (Figure III-I-4). During the flood control season (November through February) that area is

reduced to approximately 4,470 acres. Although the annual fluctuations reduce the value of flood control reservoirs as fish habitat, these reservoirs produce valuable cold and warm water fish.

Lookout Point and Hills Creek reservoirs provide nearly all the significant warm water fish habitat in all of Region 6 (Oregon and Washington). The white crappie fishery in Hills Creek reservoir is a significant spring event that adds measurably to the fishing opportunities on the Forest. Efforts are occurring to identify the proper fish species for use in Lookout Point Reservoir to establish a self-sustaining fishery. Each of the reservoirs, except Lookout Point Reservoir, is stocked with fingerling and/or legal-sized rainbow by ODFW to support the major fisheries that occur there. Lookout Point Reservoir receives annual stocking with juvenile spring chinook.

Several volunteer organizations have been instrumental in helping the Forest develop technology for establishing terrestrial vegetation in reservoir drawdown zones. This vegetation is expected to: provide structural diversity and protective cover for juvenile fish; add organic matter to the reservoir food web; provide big-game winter forage; and improve the visual characteristics of the reservoir slopes.

The demand for fish and fishing opportunities in western Oregon continues at a strong steady level (Lowry 1977, Griggs 1984).

Table III-I-4. Reservoirs on the Willamette National Forest

Reservoir	Agency	Full Pool Acres	Low Pool Acres	Fish Species Present [4]
Detroit	COE [1]	3,580	1,450	Rb, K, BrB, SCh
Carmen	EWEB0 [2]	30	15	Rb, BT
Smith	EWEB	170	170	Rb, BT, CT
Trailbridge	EWEB	120	120	Rb, BuT, CT, BT
Blue River	COE	1,420	130	Rb, CT, SCh, CSu
Cougar	COE	1,280	635	Rb, Wf, BuT
Lookout Point	COE	1,940 [3]	400	Sq, K, SCh, CSu, BrB, WC, BC, RsS, LB, Rb
Hills Creek	COE	2,710	1,550	Rb, WC, BC, BrB, CT, RsS, LB
TOTAL		11,250	4,470	

[1] United States Army Corps of Engineers (COE).
[2] Eugene Water and Electric Board (EWEB).
[3] Inside Forest Boundary
[4] Rainbow (RB), Kokanee (K), Brook Trout (BT), Bull Trout (BuT), Spring Chinook Salmon (SCh), Whitefish (Wf), Squawfish (Sq), Coarsescaled Sucker (CSu), Brown Bullhead (BrB), White Crappie (WC), Black Crappie (BC), Redside Shiner (RsS), Chiselmouth (CH), Largemouth Bass (LB).

Future Trends

The spring chinook of the lower Willamette and Columbia Rivers will continue to be dependent upon the quality water and habitat conditions of the Forest. Increased supplies of spring chinook and winter and summer steelhead will occur from four sources: hatcheries, habitat improvement, passage improvement, and cooperation with other agencies.

The Oregon Department of Fish and Wildlife is planning to increase the Willamette River spring chinook populations by 25%. Fish passage improvements at Foster Dam, Leaburg Dam, and Willamette Falls (Oregon City) are improving survival rates of naturally produced smolts, leading to greater returns of

adults. Protection of the undammed tributaries of the McKenzie River system will contribute to habitat productivity. These tributaries include streams on the Forest such as Horse Creek, Deer Creek, Lost Creek, and the South Fork of the McKenzie below Cougar Reservoir. Fisheries management of the McKenzie River above Leaburg Dam will focus on Spring Chinook and wild trout. The Northwest Power Planning Council is preparing a critical review of the full production potential for all anadromous fish in the Willamette Basin. The Northwest Power Planning Council program mitigating the effects of hydropower production will, in the longer term, finance projects designed to improve the inherent productivity of stream habitat and may also fund development of fish production facilities. Any production facilities added will rely heavily upon the high quality water produced on the Forest.

When fish passage improvements are provided by the Army Corps of Engineers at the Fall Creek, Foster, and Green Peter Dams; these drainages will support increased anadromous fish production. Recent activity by local organizations is seeking to intensify fisheries management of major salmonid habitat on- and off-Forest to improve economic benefits to local communities (i.e., McKenzie-Willamette Fisheries Enhancement Group sponsored by Lane County Intergovernmental Relations Committee). Maintenance of high quality water and improvement in riparian habitat will continue to strongly influence resident fisheries on the Forest. Although there has been habitat recovery in some drainages such as Fall Creek and Salmon Creek, the ability of the streams on the Forest to produce resident trout in the future is contingent on the continuation of fishery habitat improvements. Historically, the ODFW has supported a put-and-take fishery at selected sites on the streams, reservoirs, and lakes within the Forest boundary. Legal sized trout are intermittently stocked near recreation areas from May to September, to augment fish populations. The high cost of augmenting naturally produced stream trout with legal sized hatchery fish dictates that only a few of the more heavily fished streams will continue to be stocked by ODFW. This practice is being heavily scrutinized and will probably be reduced over time. The high mountain lakes fish populations and fisheries are expected to continue at current levels with the exception of a few non-Wilderness lakes where habitat improvements will be made to improve productivity.

The full development of resident warm-water fisheries at Hills Creek and Lookout Point Reservoirs will be important to future management of the Forest. Currently, Lookout Point has the biggest untapped resident fishery potential of the eight reservoirs on the Forest. Resolution of predation and competition problems will increase both fish production and fishing opportunities. As well, the manipulation of vegetation on drawdown zones of flood control reservoirs will provide bank stability and increase fish productivity. This vegetation will provide forage for animals, a food base for aquatic invertebrates, and serves as a nursery area for young warm water fish.

The Forest expects to invest substantial habitat improvement funds to augment the work of volunteer organizations to capitalize on this opportunity. Fishing organizations and volunteers are expected to play an important role in continuing to improve fish habitat and our knowledge base. The Challenge Grant Program for funding habitat improvements will stimulate investment in those areas where local interest is highest, and organizations other than USDA Forest Service can provide part of the funding. In addition, volunteers will be accomplishing surveys, collecting data, and doing projects to improve the management of the Forest fish resource.

The improvements in anadromous fish habitat and numbers, improvements in the productivity of the reservoirs, and the establishment of a fishery in Lookout Point Reservoir can be expected to have a significant impact of the local economies of the areas where the fisheries occur. For example, a 25% increase in population and catch of spring chinook will add 2,000 fish (31,200 pounds) worth $32,760 (RPA values) annually to the Columbia River commercial fishery and 3,750 fish worth $370,000 to the lower Willamette River sport fishery. This expansion in the population is dependent upon habitat maintenance and continued production of high quality water for the hatcheries, and in-stream production.

WILDLIFE

The Forest provides diverse habitats which support over 260 wildlife species. This includes 170 avian breeding species, 64 mammalian species, and 30 amphibian and reptilian species.

Several important roles are played by wildlife in the Forest. As predators, animals act as natural controls of insect populations, helping reduce the frequency and severity of epidemics. Predators also remove sick and weak individuals, influencing the populations of prey species. Burrowing or tunneling animals aerate the soil and carry the remains of plants and prey to lower levels. All of these smaller animals in turn support a host of larger predators. Animals that feed on plants and their seeds are agents in helping to disseminate seed. Some are pollinators; others browse or clip vegetation for food. As certain animals dig and grub for food in logs they are helping with the breakdown of this larger material that enables quicker decomposition of organic matter. Aquatic animals like the beaver alter water flow patterns, create marshes, and meadows. Beaver ponds also provide excellent habitat for resident trout and young anadromous fish.

Wildlife also contributes to local economies. Communities near the Forest benefit from the tourist income generated from hunting and sightseeing recreationists.

Historical Trends

Habitat conditions are the prime determinants of wildlife abundance both in the number of species and the number of individuals over time. The abundance of most wildlife species is directly dependent upon the condition of available habitat, whether used for breeding, feeding, or resting.

The mosaic of wildlife habitat on the Forest has been continuously changing. Prior to the early 1900s, wildfire was the primary source of disturbance to the Forest environment of the Western Cascades, although floods, landslides, drought, and wind also influenced habitat conditions. Forest management activities tend to alter the stages of plant succession in a similar fashion to wildfire. However, management activities may change the habitat composition and rate of successional development. Another major difference between natural succession following wildfire and Forest management activities is that during activities such as road building and timber harvest nutrients are being actively removed from the system in the form of logs, rock, fill material, and other products.

The relationship between wildfire and succession has been used to predict the effects of Forest management activities on wildlife populations. Habitat management systems affecting Forest management activities and wildlife populations have historically focused on contolling damage to tree seedlings, and maintenance of habitat for game species. More recent research focuses on the retention of snags, down logs, and remnant live trees within managed stands, and landscape patterns created as a result of Forest management activities. These factors are now believed to be an integral part of maintaining biological diversity. (For more information regarding vegetation diversity, refer to the Vegetation Section.)

Species populations adapted to a wide variety of plant communities and stand conditions have been less likely to decline because of the number of habitat options available to them. Examples of these species are deer, elk, and bear. However, as the landscape is converted from natural conditions dominated by old-growth Forest stands into young, managed stands wide fluctuations in deer and elk numbers may occur due to lack of high quality cover resulting in poor winter survival. Other species, such as the northern spotted owl, are more dependent on specific stand conditions. Their populations have been more likely to decline as the amount of Forest lands in late stages of stand development decreases. Some species are affected less by direct changes in vegetation conditions. Peregrine falcons, for example,

are cliff-nesting birds whose productivity has been more strongly influenced by pesticide use, prey abundance, and predation than by the changes to Forest vegetation. Prey populations of peregrine falcons are directly influenced by vegetation diversity which provides for high populations of song birds.

The Endangered Species Act of 1973, as amended, declared that federal agencies shall seek to conserve endangered and threatened species of plants and animals. Two species of birds, the northern bald eagle and peregrine falcon, occur on the Forest and are listed as threatened or endangered in the 1989 Federal Register. Several other species are either proposed or being considered for listing. All federal, state, and regional proposed, threatened, endangered, and sensitive species are listed on the Regional Foresters Sensitive Species List. (See Figures III-G-8, Threatened, Endangered and Sensitive Plant Species, and Figure III-J-1).

All species in a given area must be maintained to assure the continued existence of the populations throughout their natural range. Managing for viable populations of wildlife species reduces the potential for species becoming listed as Threatened, Endangered, or Sensitive (TE&S) or for local elimination of the species.

Table III-J-1. Threatened, Endangered or Sensitive Fish and Wildlife Species

Species	Designation	Forest Occurrence
BIRDS		
Harlequin duck	R-6 sensitive	Habitat exists on forest. Pairs sighted regularly along major rivers and streams.
Ferrugenous hawk	R-6 sensitive	Occasional visitor. Inadequate foraging habitat to support breeding.
Peregrine falcon	Federal/endangered	No known nest sites on Forest. Potential nesting habitat exists. Several sightings have occurred on Forest.
Bald eagle	Federal/threatened	Seven known active nest sites. Utilizes habitat on Forest for winter forage sites.
Greater sandhill crane	R-6 sensitive	Habitat limited to high lake country. Birds breed in marshes of lakes just outside the Forest boundaries.
Northern spotted owl	Proposed federal listing Oregon/threatened R-6 sensitive	Habitat exists on Forest. Known nesting, roosting, foraging sites are identified on Forest.

Table III-J-1Cont. Threatened, Endangered or Sensitive Fish and Wildlife Species

Species	Designation	Forest Occurrence
MAMMALS		
Pacific western big-eared bat	Federal candidate Category 2 R-6 sensitive	Habitat exists on Forest and two known roost sites identified. Other sites on private land within forest and on neighboring lands
White footed vole	Federal candidate Category 2 R-6 sensitive	Habitat exists on forest and 3 known sites identified.
California Wolverine	Federal candidate Category 2 Oregon/threatened R-6 sensitive	Intermittent sightings over the past 20 years on Forest. Majority of sightings in the Wilderness where abundant habitat exists.
AMPHIBIANS		
Red-legged frog	R-6 Sensitive	Habitat exists on Forest and scattered sightings have been reported in past 10 years.
FISH		
Oregon chub	Federal candidate Category 2 R-6 sensitive	Habitat exists on Forest and species occurs at two known sites.
Klamath large-scale sucker	Federal candidate Category 2 R-6 sensitive	Species documented as having occurred on Forest
Bull trout	Federal candidate Category 2 R-6 sensitive	Habitat exists on Forest with distribution limited to the upper reaches of a single drainage.
INVERTEBRATES		
Beer's false penny beetle	Federal candidate Category 2	Species documented as having occurred on Forest
Mt. Hood primitive caddisfly	Federal candidate Category 2	Detroit R.D.
Tombstone prairie caddisfly (*Farula reaperi*)	Federal candidate Category 2	One record from 1965; Sweet Home R.D.
Tombstone prairie caddisfly (*Oligophlebodes mosthento*)	Federal candidate Category 2	Blue River R.D.
Ft. Dick Limnephilus caddisfly	Federal candidate Category 2	One record from 1969; Oakridge R.D.
One-spot caddisfly	Federal candidate Category 2	Rigdon Ranger District

Current Situation

The implementing regulations for the National Forest Management Act of 1976 (NFMA) require the Forest Service to plan the management of wildlife habitats to "maintain viable populations of existing native and desired non-native vertebrate species in the planning area." To facilitate management of all these species, NFMA further requires each Forest to identify management indicator species (MIS) through the planning process and to establish objectives to maintain and improve the habitats of these indicator species. Implementing regulations for NFMA further define viable population management. "In order to insure that viable populations will be maintained, habitat must be provided to support at least a minimum number of reproductive individuals and that habitat must be well distributed so that individuals can interact with others in the planning area" (36CFR 219.19).

Seven species of wildlife, one group of bird species, resident fish, and anadromous fish have been selected as management indicator species to represent the habitat needs for fish and wildlife species present on the Forest. Management indicator species are considered representative of other species with similar habitat requirements for life and reproduction. By managing for viable populations of indicator species and their associated habitat, viability risks for other species found in the same habitats are reduced.

Management indicator species represent either featured species or ecological indicators. Featured species are threatened and endangered plant and animal species on federal lists, species that are hunted, fished, or trapped, species of special concern or interest, and species with special habitat needs that may be at risk due to planned management activities. Ecological indicator species were selected because their population and habitat changes indicate potential effects of management activities on other species dependent on selected habitat types or water quality. Population and habitat recovery objectives for federally Listed Threatened and Endangered species are determined by the U.S. Fish and Wildlife Service and encorporated into Land and Resource Management Plans through development of interagency Management Plans designed to meet site specific needs for habitat protection and enhancement. Usually each nest site or territory has a site specific plan to ensure recovery objectives are met.

Figure III-J-2 lists the species with special management requirements for the Forest, and is followed by a discussion of each species. The selection of these species was based on the following criteria:

1. Endangered or threatened species identified on federal lists for the planning area;

2. Economically important species that are commonly hunted, fished, or trapped; or

3. Species having limited or specific habitat requirements that may be significantly influenced by management practices. Limiting habitats are those habitats which may be subject to reduction by unconstrained management activities below levels necessary to maintain viable populations.

Table III-J-2. Management Indicator Species

Indicator Species	Habitat Feature	Selection Criteria
Spotted Owl	Threatened species; Old-growth and mature conifers	Ecological Indicator, represents limited habitat
Pileated Woodpecker	Old-growth and mature conifers	Ecological Indicator, represents limited habitat
Pine Marten	Old-growth and mature conifers	Ecological Indicator, represents limited habitat
Elk	Winter range	Commonly hunted
Deer	Winter range	Commonly hunted
Cavity Excavators	Dead and decaying trees	Ecological Indicator, represents limited habitat
Bald Eagle	Threatened species (T&E habitat)	Federal Register List of T&E species
Peregrine Falcon	Endangered species; nesting habitat near prey	Federal Register List of T&E species
Anadromous Fish [1]	Water quality	Commonly fished
Resident Fish [1]	Water quality	Commonly fished

[1]Anadromous and resident fish are discussed in Section I, Fish.

Through Region-wide coordination, each Forest identified the minimum numbers, distribution, and habitat characteristics needed to satisfy life history needs for each species or group of species identified as having a Management Requirement(MR). Report on Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region, USDA Forest Service, June 1986. Maintenance of the MRs ensures the viability of management indicator species and the species they represent. MRs are therefore incorporated into all of the Alternatives, except for the No Change Alternative.

Old growth and Mature Conifer Habitat

Old growth and mature conifer habitat provides the feeding, resting, and breeding areas that are required by the northern spotted owl, pileated woodpecker, and pine marten. These management indicator species represent wildlife associated with late seral stages of Forest development. As ecological indicators, these wildlife species represent all species which may be affected by limited amounts, distribution, and quality of mature and old-growth coniferous forests.

Bald Eagle: Threatened and Endangered Species - The bald eagle is listed in the Federal Register as a threatened species. Examination of Forest conditions near nest sites has shown that bald eagles require Forests with old-growth characteristics for nesting (Anthony et al. 1989). The diameter and height of individual nest trees are usually the dominant and largest diameter trees in the stand. Bald eagles require large trees with stout thick limbs to support their large nests which may be up to 10 feet in diameter and can weigh in excess of several hundred pounds (U.S. Department of Interior,

Fish and Wildlife 1982). Perch trees associated with the nest tree need to be tall enough to provide a clear line of sight to the forage area and surrounding terrain. Bald eagles need to feed without interference from human activity (Stalmaster and Newman 1978). All Forested lands within 1.1 miles of the shoreline of major water bodies can be considered potential nesting habitat (U.S. Department of Interior, Fish and Wildlife 1981).

Tenacity to a nest site is weakest in late winter and early spring when a pair first establishes a territory. Disturbance of even limited duration at that time may cause desertion of the site (Fyfe and Olendorff 1976). Nest abandonment, however, can occur at any time as the result of frequent and persistent disturbance.

Bald eagle roosting and feeding areas are usually associated with rivers, lakes, and reservoirs. No communal roost sites have been identified on the Forest. Resident and wintering populations tend to be dispersed within territories around foraging areas. Human activity can adversely affect feeding bald eagles (Stalmaster and Newman 1978). The availability of and access to fish, water-fowl, invertebrates, and carrion becomes critical in nesting season. Young bald eagles are less tolerant of food deprivation than the adults.

Systematic surveys are conducted annually by the Forest Service and the Oregon Department of Fish and Wildlife. There are five known bald eagle nest sites on the Forest. Pairs of bald eagles occupy primary and alternate nest sites along Lookout Point Reservoir and Hills Creek Reservoir (2). Surveys conducted in 1989 confirmed additional nesting pairs at Detroit Resevoir, Clear Lake, and Erma Bell Lakes. Seventeen potential nest sites containing at least 125 acres of nesting habitat have been identified around 11 major water bodies.

When bald eagle nests are found, site specific management plans are prepared in compliance with the USDI Fish and Wildlife Service recommendations and in accordance with the Pacific States Bald Eagle Recovery Plan (1986). Roost sites that are identified in the future will be managed in accordance with the Pacific States Bald Eagle Recovery Plan.

Northern Spotted Owl:Ecological Indicator - The Northern Spotted Owl is listed as a Sensitive Species on the Regional Forester's Sensitive Species List. The spotted owl has been the center of controversy throughout its range. Debate centers on the threat to species viability due to harvesting mature and old-growth forests and silvicultural practices which are designed for harvest rotations of less than 100 years. The northern spotted owl has been proposed and is being considered for listing on the Federal Register for Threatened and Endangered Species.

Old-growth Forests provide high quality habitat for nesting, roosting, and foraging spotted owls. Recent studies have suggested that the northern spotted owl uses habitat areas ranging in size from about 1,000 acres to 3,000 acres. The *Final Supplemental Environmental Impact Statement* (FSEIS 1988) and *Amendment to the Regional Guide* (1989) requires at least 1,500 acres of mature and old-growth habitat for a pair of spotted owls in the Oregon Cascades. All allocated habitat should occur within 1.5 miles of the nest or roost site. Information from the FSEIS for the spotted owl indicates that a larger home range of approximately 6,600 acres, with 2600 acres of mature or old-growth habitat, may be utiliized by a pair of spotted owls.

The principal prey species of the spotted owl are primarily found in mature and old-growth Forests. The northern flying squirrel is the most abundant prey species in spotted owl diets in northwestern Oregon. Prey species may be more abundant and available in old-growth stands than second growth stands. The size of the old-growth limbs are larger and able to support arboreal nests of flying squirrels and red tree voles. Snags and down logs are generally abundant. Foraging perches found in old-growth

stands enhance detection and capture of prey. In addition, many old-growth stands lack the dense understory brush associated with second growth Forests. An open understory may make detection and capture of prey more energy efficient.

Northern spotted owls do not build nests, but rely on pre-existing cavities, broken tops or platform structures as potential nest sites. Large, decadent trees with missing limbs and tops provide these cavities and platforms for spotted owl nests. Selection of old-growth nesting habitat by spotted owls is also influenced by prey abundance. Production of prey biomass is greater in old-growth than that produced in second growth stands. This abundance of prey provides an optimal environment to support food requirements of young as well as adults.

Multi-layered canopies associated with old-growth stands provide favorable roosting habitat that moderates temperature extremes, producing shade during warm weather, and buffering the effects of cold, wet weather and snow. Juvenile spotted owls are dependent on leaning trees and understory trees for climbing off the ground once they have fledged from the nest, but are not yet mobile enough to escape predators. Once off the ground, multi-layered canopies provide hiding cover from predators such as the great-horned owl and goshawk.

The Forest has verified the presence of 219 spotted owl pairs since 1985. During 1989, 156 pairs were reverified. Of these, 15 pairs were located within Wilderness or lands Congressionally reserved from timber harvest.

In compliance with the implementing regulations for the National Forest Management Act of 1976, spotted owl habitat will be provided to ensure existence of a viable population of the species. The Region 6 Planning Guide requires all National Forests within the Cascades Province to maintain 1,500 acre spotted owl habitat areas (SOHAs) with specific guidelines on spacing to ensure distribution across the range of the species.

The process used to establish viable population levels is fully discussed in the Spotted Owl FSEIS and Amendment to the Regional Guide. The Amendment to the Regional Guide estimated current habitat capability of the Forest to be 254 pairs of spotted owls. The 15 year capability to be maintained is 225 pairs of spotted owls. The SOHA network developed under the Regional Guide resulted in establishment of 59 SOHAs protecting 60 pairs of spotted owls. In addition to the 59 SOHAs, 83,680 acres of suitable habitat capable of supporting 35 additional pairs of owls exists within Wilderness and other Reserved areas. The Forest's SOHAs and reserved sites contribute to the Regional MR network for managing spotted owls throughout its range in Oregon and Washington. It should be noted that not all the habitat acres within the SOHAs are on lands suitable for timber harvest. Approximately 10800 acres within the SOHA network (12%) coincides with lands unsuited for timber production.

Pileated Woodpecker:Ecological Indicator - The pileated woodpecker represents those wildlife species which use large, standing dead trees (snags) and mature/old-growth trees when nesting, roosting, or foraging. Downed logs also serve as an important habitat function by providing foraging areas for insect and fungi eating species, as well as habitat for many repitles and amphibians. The diet of the pileated woodpecker consists predominantly of carpenter ants, termites, and other insects found in decaying wood. Foraging surfaces tend to be decayed tree trunks, dead limbs, snags and downed logs associated with mature and old-growth Forests (Mannen 1980). Nesting habitat is most often found in mature and old-growth Forests. The average diameter of a pileated woodpecker nest tree is 25 inches (Brown 1985). The pileated woodpecker is the largest of the woodpeckers, averaging 16 to 20 inches in height. Due to this large size, a pileated woodpecker requires at least a 21-inch d.b.h. nest tree to accommodate itself and its young. Research conducted in Western Oregon suggests that pileated woodpeckers have relatively large home ranges often exceeding 1000 acres in size (Mellen 1987). When

foraging, pileated woodpeckers tend to avoid openings, although they have been observed using shelterwoods on a regular basis (Evelyn Bull, personal communication). Minimum requirements for pileated woodpecker habitat estabished for Region 6 provide 600 acres of habitat per pair. At least 300 acres must be mature or and old-growth Forest.

No systematically collected survey data exists on the Forest for pileated woodpeckers or other wildlife species associated with the habitat features represented by this MR. Existing Forest habitat capability for this species is estimated at 514 individuals based on habitat availability and distribution.

Marten: Ecological Indicator - The marten represents wildlife species dependent on mature and old-growth forests for at least a portion of their life history needs. Marten home ranges often include several seral Forest conditions, ranging from poles to old-growth. Dead, down, and defective trees characteristic of old-growth Forests and seral fire regenerated Forests are critical to marten survival. Downed logs and snags provide potential den sites and access to small mammal prey that are active during winter months (Clark and Campbell 1976). An overhead Forest canopy provides protection from aerial predators (Herman and Fuller 1974).

The recommended habitat area (MR) for marten includes at least 160 acres of contiguous mature or old-growth forest. Home range size of individual marten may be significantly larger (Irwin 1987). Little information is available on home range size or habitat use on the west slope of the Cascade Mountains. The habitat characteristics of primary reproductive or core area habitat for marten are similar to those of the pileated woodpecker and spotted owl. Thus, habitat areas designated for spotted owls and pileated woodpecker MRs will also provide marten habitat.

No systematically collected survey data exists on the Forest for this species. Sighting and trapping records are available to establish general distribution patterns. Current habitat capability for marten is estimated to be 1,138 marten. An estimated 250,018 acres of suitable marten habitat exists on lands Congressionally removed from timber harvest. Lands unsuited for timber production may provide additional habitat, but may be in parcels to small or fragmented to provide suitable habitat to support individual home ranges.

Dead And Defective Tree Habitat

Dead and decaying trees (snags) are a vital component of the Forest ecosystem. Many wildlife species are dependent on these deteriorating trees for nesting, roosting, foraging, and other life functions. Wildlife species dependent on snags are associated with all successional stages of Forest development. Snags are an important source of food production. As the tree's wood fiber decays through time, the bark, cambium layer, and heartwood will serve as forage substrates for a rich supply of insects and bacteria. Some species such as western bluebirds, tree swallows, and violet-green swallows are secondary cavity nesters and use snags located in early seral Forests. Other species are associated with closed canopy stands. On the Forest, wildlife species dependent on dead and defective trees are represented by a group of birds referred to as primary cavity excavators.

Snags and defective trees with heartrot, fungal conks, dead branches, and old wounds are often selected by primary excavators as nest trees. Natural cavities as well as those constructed by primary excavators provide thermally regulated nest sites and over-wintering enclosures for many wildlife species.

Snags are also food storage sites where a variety of birds and mammals cache prey and other food items. Reproductive behavior and territorial defense for specific species may be critically tied to snag numbers and distribution.

Primary Cavity Excavators: Ecological Indicator - Snags, live defective trees, and down logs provide the critical habitat for primary cavity excavators and secondary cavity users.

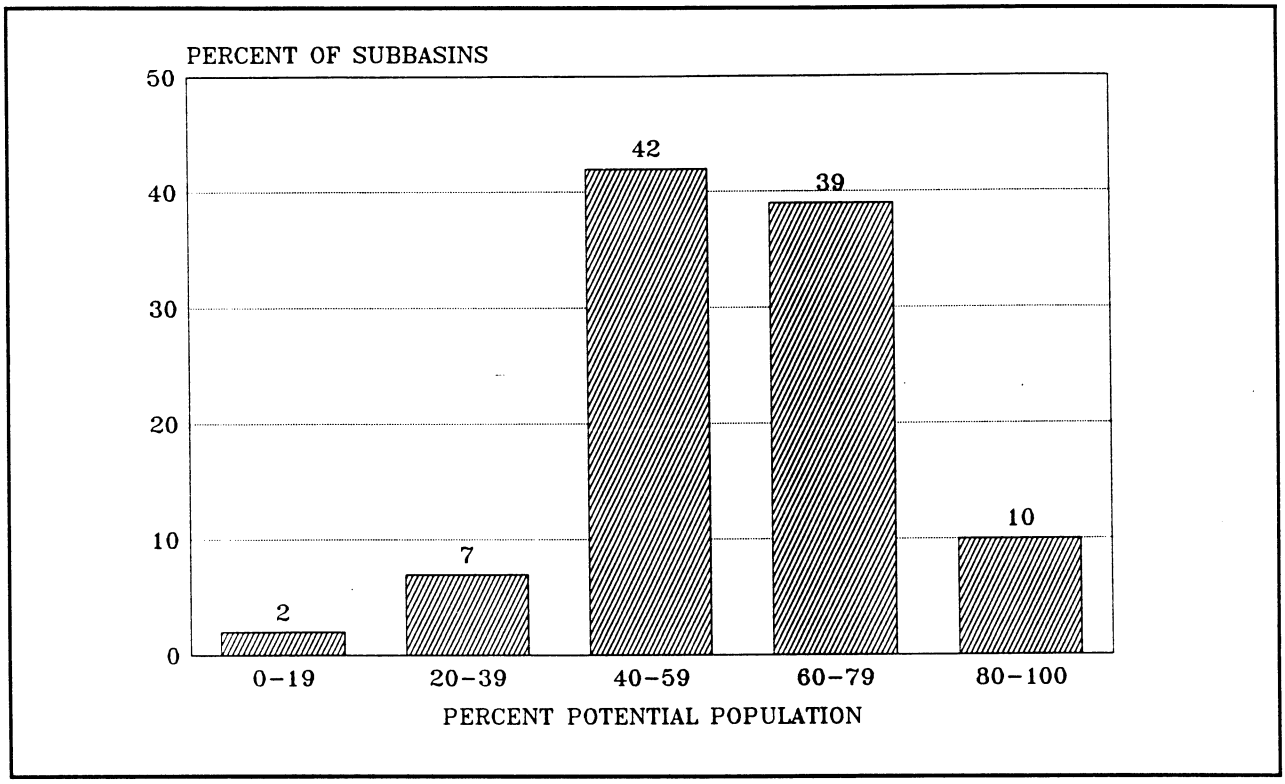
Primary cavity excavators used as ecological indicators on the Forest are those birds, other than pileated woodpeckers, which require dead and defective trees for nesting, roosting, and foraging. Primary cavity excavators create new cavities each year for roosting and nesting. Cavities constructed and abandoned by primary excavators are used by other species (secondary cavity users) for nest and roost sites.

Species of primary cavity excavators used as ecological indicators on the Forest are the red-breasted nuthatch, northern flicker, hairy woodpecker, downy woodpecker, red-breasted sapsucker, Lewis' woodpecker, black-backed woodpecker, and northern three-toed woodpecker. The amount, size, and distribution of dead and defective trees is a limiting factor in existing managed Forest stands.

No systematically collected survey data exists for primary excavator species or secondary cavity users on the Forest. Figure III-J-3 illustrates habitat capability for primary cavity excavators at the sub-watershed level.

Habitat capable of supporting high populations of insectivorous birds may be needed to maintain biological control of endemic insect population levels. The primary ecological role of these birds in controlling insect levels is moderating epidemic outbreaks.

Figure III-J-3. Subbasin Snag Levels



Deer And Elk Habitat

Deer and elk have been selected as Featured Species because they are important game species on the Forest. Economically, they are important to local communities which benefit from the revenue generated by hunters and other recreationists that like to view and photograph game species.

The historic range of Roosevelt elk, black-tailed deer, and mule deer includes all of the Forest. Long-term viability of these species is not presently a concern, but populations capable of supporting hunting and viewing demands are dependent on biological and habitat conditions.

The Oregon Department of Fish and Wildlife (ODFW) estimated the wintering populations of deer and elk to be 17,762 and 3,720, respectively as of 1987. Planning benchmarks for deer and elk populations have also been established by ODFW. Planning benchmarks provide population estimates needed to maintain current and predicted demand for hunting opportunities. To meet demand for hunting opportunity, ODFW estimates a wintering population of 24,500 deer and 6,200 elk should be provided for on the Forest.

The Roosevelt elk population on the Forest has been supplemented through a transplanting program conducted in cooperation with the ODFW beginning in 1972. Since then, about 280 Roosevelt elk have been released into areas of underutilized habitat.

During the winter months, much of the Forest is covered by deep snow. As a consequence, the herds of deer and elk that range over thousands of acres during the summer months are restricted to significantly smaller range areas for much of the time between November through April. These low elevation areas are referred to as winter range. Winter range habitat must supply deer and elk with optimal cover, an available food supply, and security. Without these habitat features wintering populations suffer high mortality during winter periods and surviving cows and does have a low potential for producing viable young the following year.
Winter range is characteristically at lower elevations and along riparian areas where snow accumulation is not as deep. High quality winter range provides protection from wind, snow, rain, and low temperatures, constant availability of quality forage, and security that limits harrassment and allows for efficient use of energy reserves. This habitat is typically found where large patches of old-growth timber provide optimal cover interspersed with meadows, major riparian areas, and harvest units. Security may be provided by all cover types, but in a managed Forest landscape harrassment and poaching may become a limiting factor associated with open roads and recreation sites.

Over the years, the total acres of winter range has been reduced. In the past few decades, flood control projects, road building, timber harvest, and recreation use have all been intensely focused on winter range on the Forest. The development of eight reservoirs in the late 50's and 60's eliminated over 11,000 acres of prime winter range for deer and elk on the Forest. The development of the reservoirs removed thousands of old-growth trees that served as optimum thermal cover and forage sources. Hundreds of deer and elk were displaced from traditional wintering areas and migration routes changed or were eliminated. As a consequence, current deer and elk populations have access to less winter range habitat than was historically available.

Habitat availability on summer range is not considered as critical or limiting as winter range. Most of the Forest provides summer range. Quality of habitat remains a concern. Summer range habitat conditions ultimately determine the amount of stored fat reserves that animals take into the winter period. Lactating does and cows and breeding bulls require high nutrional levels and efficient energy use while utilizing summer range. Little information exists on the relative quality of forage areas on the Forest.

The past few decades have brought changes in the landscape characteristics of deer and elk ranges on the Forest. The gentler slopes at lower elevation allowed greater accessibility for road building. Harvest of the mature and old-growth Forests was concentrated in these areas through 1960. Steeper terrain has been extensively roaded since 1960, and timber harvest has become distributed throughout the available Forest lands.

Roosevelt Elk: Featured Species - Roosevelt elk, blacktailed deer, and mule deer utilize similar habitats on the Forest. All species migrate using summer and winter ranges. Elk appear to be more sensitive to the effects of Forest management activities and are used to represent the habitat requirements of all three species.

Four habitat variables are recognized as being directly influenced by Forest management activities and as having significant impacts on deer and elk habitat. Forage quality, cover quality, open road density and the distribution and size of forage and cover areas contribute to habitat effectiveness. Each of these habitat variables play an important biological function, and interact at the landscape level to determine habitat effectiveness.

Forage Quality - The quality of forage ultimately determines the amount of energy, protein, minerals, and fiber an animal has available throughout the year. Most techniques used to measure forage quality have been adapted from research on domestic ungulates. Quality rather than quantity of forage is usually more limiting in western Oregon. Quantity may be of concern during specific time periods, winter and early spring, or where competition with domestic livestock occurs for the same forage resource.

Forage requirements for deer and elk can double during the winter months because of increased energy requirements imposed by the weather conditions. Since does and cow elk are normally pregnant during the winter, forage availability and accessibility are also critical. Research has indicated that cow elk having more than 3% weight loss after January and prior to calving produced calves with less than 50% chance of survival (Thorne et al. 1976).

No research has been completed on the Forest assessing the availability and quality of forage species. Research from other areas west of the Cascades has been used to describe the relationships between Forest management activities, successional Forest development, and forage quality (Wisdom et al 1986). Forages capable of providing greater than 6% digestable protein are required for maintenance of body condition. Significantly higher protein levels are required for lactating cow elk and growing young (Sharrow 1985).

Forage areas are described as vegetated lands with less than 60% canopy closure of trees and tall shrubs. The sucessional stages comprising primary forage areas in Forest types are grass-forb, shrub, and open sapling pole. Availability of forage may become limiting in the open sampling pole stands as tree and shrub heights exceed normal browse heights of deer and elk. Meadows, marshes, and bogs are also preferred forage areas.

Cover Quality - The quality of cover increases as Forest development progresses. Hiding cover develops first, and has been described as vegetation capable of hiding 90% of an individual animal at a distance of 100 feet. On the Forest most forested stands more than 15 years old begin providing cover from predators and harrassment. Viewing angle may increase the density and height of vegetation required to achieve effective hiding cover on steep terrain (Lyons 1985).

Thermal cover develops during the mid seral stages of forest development. Stands with canopy closure greater than 70%, stem diameters greater than 8 inches, and canopies at least 40 feet tall provide

thermal cover. Thermal cover offers protection against adverse weather conditions and hiding cover. The closed canopy buffers wind, moderates cold and hot ambient air temperatures, and provides some shelter from rain and snow.

Optimal cover develops late in Forest succession. Stands of optimal cover supply forage and the most effective thermal cover. Quality of cover increases with structural development of several vegetation layers and accumulation of large woody material. Low elevation stands containing old growth Douglas fir have a capacity to hold large amounts of snow in the canopy. This reduces the energy elk must expend to access forage. During periods when Forest openings become inaccessible due to snow, understory vegetation and litterfall are critical to deer and elk survival.

Figure III-J-4 displays the relationship between succession development in Forested ecosystems and deer and elk habitat.

Distribution and Size of Forage and Cover Areas - The distance deer and elk travel into cover or forage areas determines how effective individual stands or landscapes are in meeting habitat requirements. Maximum use of forage with the least expenditure of energy occurs when forage and cover are interspersed. Size of individual openings become less effective as the distance from cover increases. The relationship of stand size and effective habitat distribution can be expressed in terms of distance from edge (Figure III-J-5 displays this relationship).

The current amount and type of cover and forage areas on summer and winter range is displayed in Figure III-J-6. These percentages represent a Forest-wide average. Depending upon the amount of past timber harvest activity, frequency of harvest entry, and size of harvest units within a given subdrainage, amounts and distribution of forage and cover areas varies throughout the Forest.

Rate of timber harvest determines the long-term availability and distribution of forage and cover areas. Natural forage openings comprise only 1% of the Forest. Openings created during timber harvest make up 13% of the Forest. Continued long-term availability of forage openings depends on timber harvest or fire in many areas of the Forest.

Figure III-J-4. Deer and Elk Forage and Cover Areas

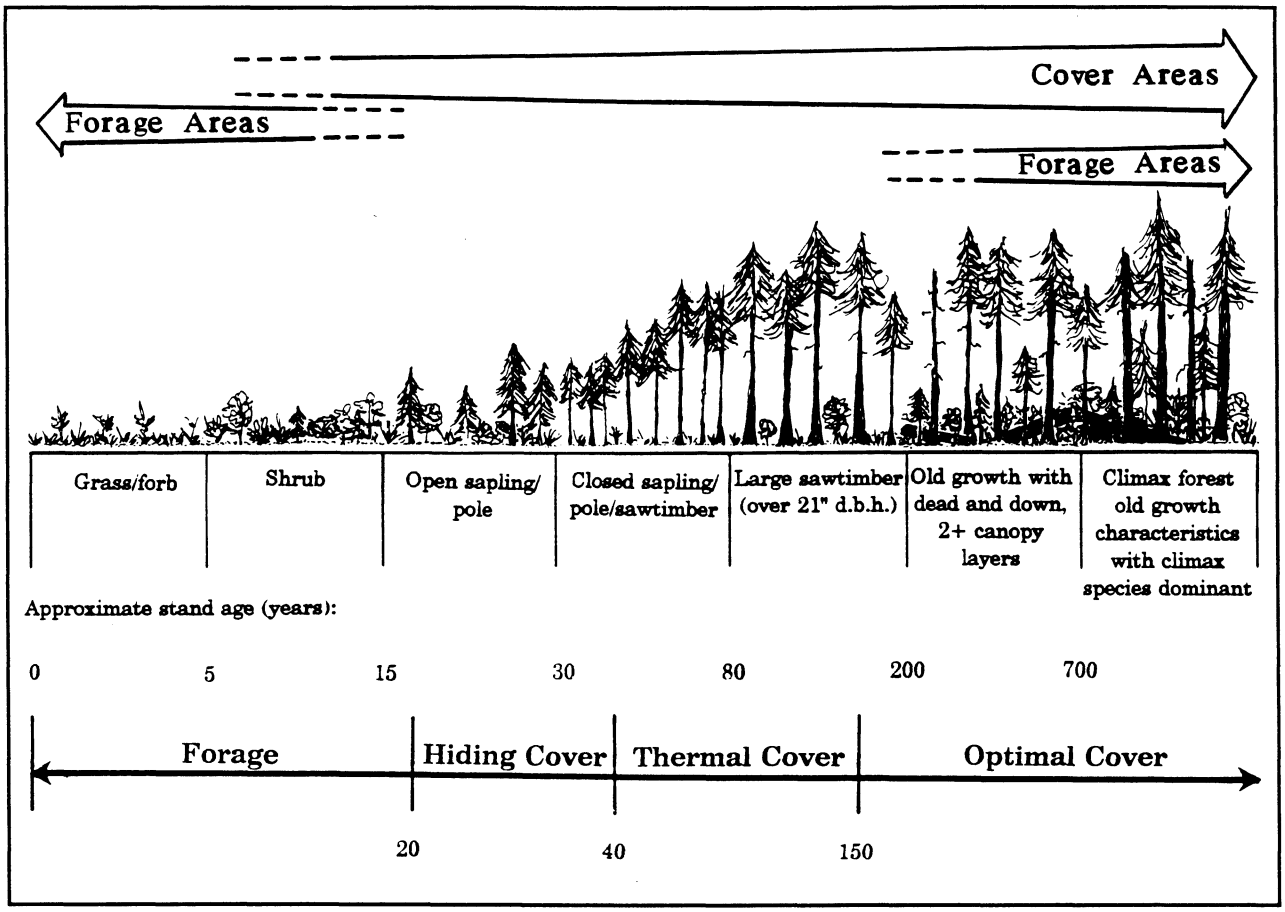
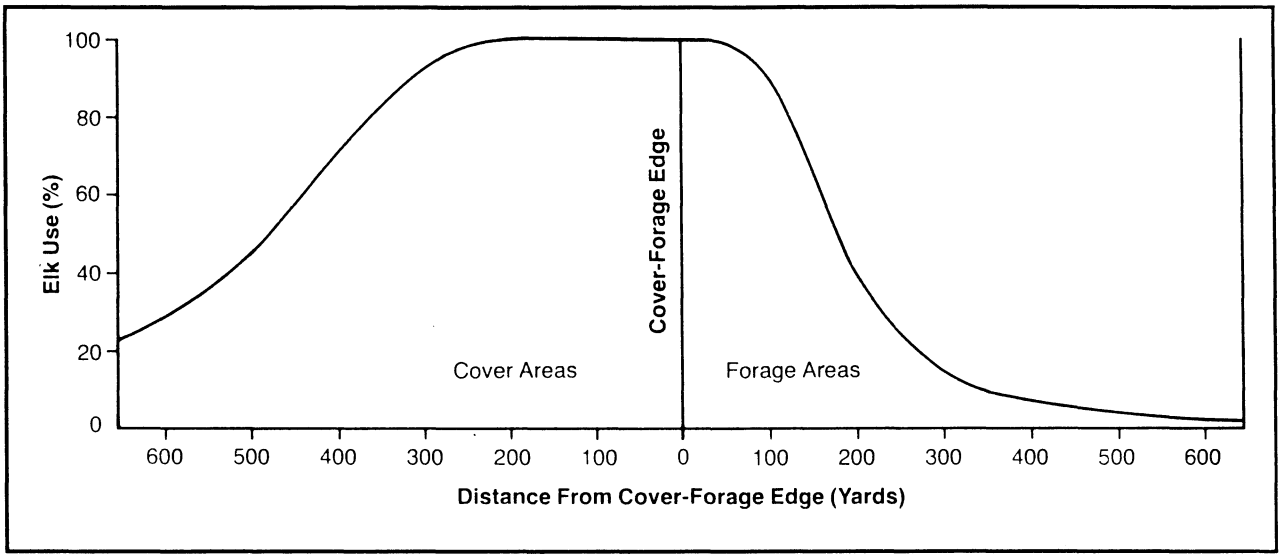
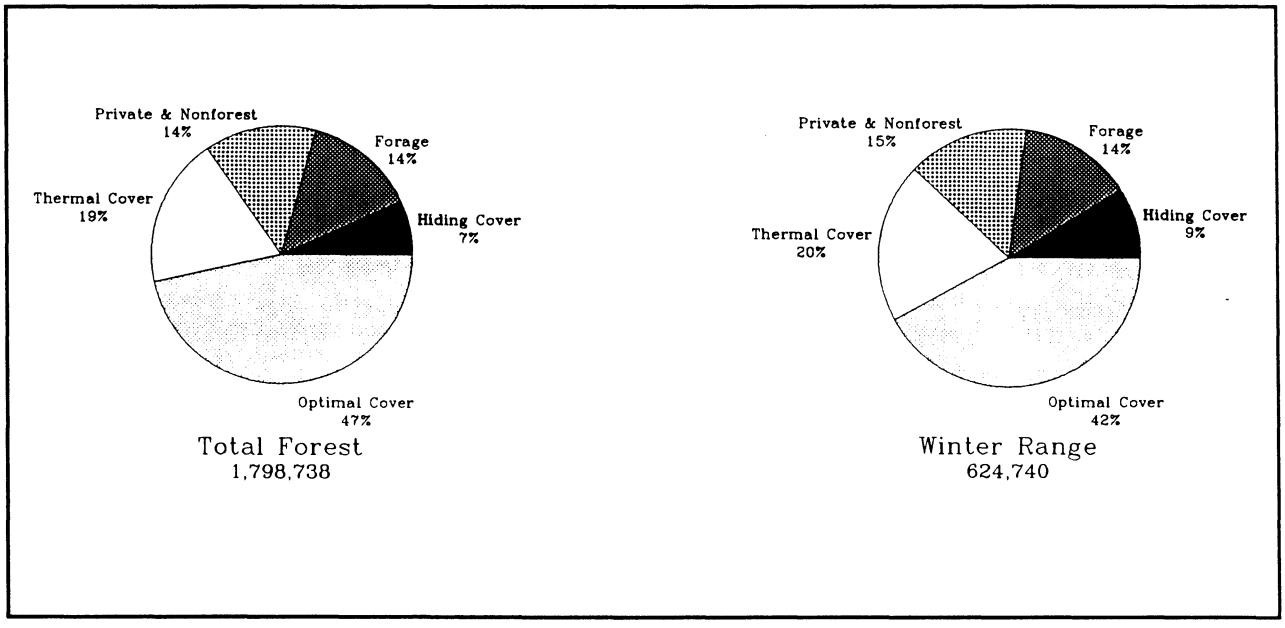


Figure III-J-5. Relationship of Elk Use to Distance from Cover-Forage



Source: Wisdom et al. 1986

Figure III-J-6. Existing Distribution of Forage and Cover Types



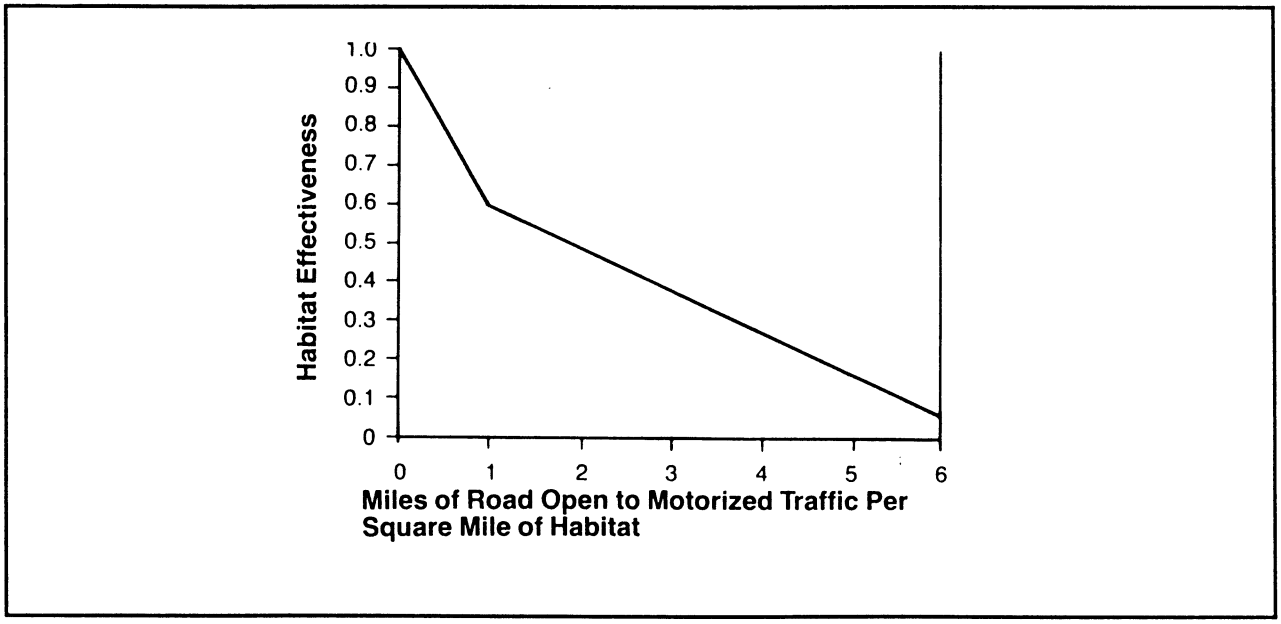
Density of Roads Open to Moterized Vehicles - Elk avoid roads to a greater degree than deer. Roads open to vehicular traffic significantly affect use of adjacent habitat by elk (Lyon 1983, Witmer and DeCalesta 1985). Hunted population show greater avoidance than populations that are protected. The frequency of road use that results in habitat avoidance has not been determined.

Open roads have been identified as a limiting factor in bull escapement during hunting seasons. In addition, ODFW estimates that significant numbers of deer and elk are illegally harvested (TWS 1989). Open roads reduce effective law enforcement capability because of the number of escape routes available to poachers. Because summering populations are dispersed over a larger geographic are, they are less suceptable to poaching. Exceptions occur near key use areas and along migratory routes. Figure III-J-7 displays the relationship between habitat effectiveness and miles of road open to motorized vehicles.

Current estimates are that 6500 miles of road are present on the Willamette. Higher elevation summer ranges contain more wilderness and roadless areas thus have an overall lower road density. Road closures have been implemented and timber sale contracts have been modified in an effort to reduce harassment to elk during winter and calving periods.

Surveys of hunters indicate that the greatest concern associated with current habitat conditions and recreational opportunities is the density of open roads (ODFW 1983). Hunters expressed concern at the lack of "walk-in" hunting opportunities, and the impacts of illegal harvest on opportunities to be successful during designated hunting seasons.

Figure III-J-7 Relationship of density of roads to habitat effectiveness



(Lyon 1983)

Special and Unique Habitats

Special and unique wildlife habitats are found throughout the Forest. These habitats are often associated with natural Forest openings, riparian areas, meadows, hardwood Forests, geologic features such as cliffs, talus, and caves and open water. Meadows provide foraging areas for numerous species including elk, bear, deer, and song birds. Predators including hawks, owls, falcons, coyotes, foxes use meadows and riparian habitats extensively while hunting. Caves are an important habitat element for bobcats, cougars, and bats providing shelter, roost, and den sites and protection from predators. Cliffs provide secure places for a variety of raptors to nest and rear their young. Talus concentrates animals such as pikas, frogs, toads, lizards, snakes, and other small mammals, and provides protection for some species during reproduction and hibernation. Open water provides needed habitat for wintering waterfowl, as well as foraging for eagles, ospray, and other fish eating species. Although these areas are a relatively small part (146,153 acres) of the Forest, they contribute significantly to the diversity of wildlife species.

In the past, some of these special and unique habitats have been altered by timber management and road building activities. The removal of Forest stands adjacent to special wildlife habitats alters food sources, eliminates visual barriers, opens areas to increased human harassment, and changes wind current patterns. Although natural openings such as caves, cliffs, and talus have not been changed to any great extent, the surrounding vegetation which contributes to their microclimatic conditions or usefulness as habitat for certain wildlife species has often changed dramatically.

Peregrine Falcon: Endangered Species

The peregrine falcon is listed in the Federal Register as an endangered species. A systematic inventory and survey for peregrine falcon has not been completed on the Forest. No nesting pairs of peregrine falcons have been found on the Forest, although several sightings have occurred. In 1981, the Forest in cooperation with ODFW identified cliffs meeting nest site characteristics for peregrine falcons. Subsequently, the ODFW conducted an aerial reconnaisance and identified 12 of these sites as having high potential as nest sites, but found no peregrines present. Table III-J-8 displays the locations of potential peregrine falcon nest sites.

Table T013. Potential Nest Sites for the Peregrine Falcon (III-J-8)

Ranger District	Location	Legal
Detroit	Mt. Beachie	T9S R5E Sec. 11/12
	Blowout Cliff	T10S R5E Sec. 23 (mostly private)
	Puzzle Creek	T11S R8E Sec 26/27
Sweet Home	Scar Mt.	T12S R6E Sec. 31/32
	Jumpoff Joe	T14S R5E Sec. 11
McKenzie	Lookout Mt.	T15S R6E Sec. 31/32
	Horse Creek	T16S R6E Sec. 28-34
Blue River	None	
Lowell	None	
Oakridge	Monteith Rock	T21S R4E Sec. 20/28
	Mt. David Douglas	T22S R5E Sec. 24
Rigdon	Balm Mt.	T25S R3E Sec. 23 (with Umpqua N.F.)
	Dome Rock	T24S R3E Sec. 36

In the Pacific states, American peregrine falcons nest almost exclusively on cliffs, usually near water and abundant populations of song birds. Preliminary studies show peregrines prefer nest sites that are sheer cliffs 150 feet or more in height. The cliff usually has a small cave or overhang ledge large enough to contain three or four full grown nestlings (USDI Fish and Wildlife 1982).

The direct use of cliff habitats for nesting and dependence on diverse vegetation conditions for high populations of prey species makes the peregrine falcon a featured species form these habitat types. Many other species of raptors are also commonly found in association with special and unique habitats. The diversity of wildlife species and habitats associated with special and unique features contributes significantly to the long-term recovery potential for peregrine falcons and to maintaining viability of many wildlife species.

Future Trends

Habitat of native and desired non-native species will be maintained at levels capable of supporting viable populations. The use of Management Requirements (MRs) for featured species will provide habitat conditions distributed throughout the Forest to ensure that all represented species exist in viable numbers. This will be accomplished by managing habitats and populations so that limiting factors are reduced and habitat characteristics are provided in the vegetation mosaic throughout the Forest.

Habitat conditions for those species associated with old-growth Forests will continue to decline. Forests managed on rotations less than 150 years will not provide suitable habitat. Only those areas allocated

to no harvest prescriptions will provide suitable habitat for species dependent on mature or older forests conditions.

Although the overall number of species present on the National Forests will remain stable, large fluctuations in the number of individuals within a species will likely occur. Populations are expected to remain viable, but whether the populations are high enough to ensure that the biological function of the species in the ecosystem remains uncertain.

Nesting peregrine falcons are likely to be found on the Forest in the near future. The species has been reported nesting on the adjacent National Forests and suitable habitat exists on this Forest. The Forest will be maintaining the 12 potential nest sites in suitable cliff habitat identified in the 1981 assessment of potential nest sites. When presence of nesting peregrine falcons, is verified, site specific management plans will be developed. All nest sites will managed in compliance with the USDI Fish and Wildlife Service recommendations and the "Pacific Coast Recovery Plan for the American Peregrine Falcon" (1982).

INSECTS AND DISEASE

Insects and diseases play a very important role in the ecosystem. Insects provide food for other insects, animals, and fish and act as plant pollinators. Many insects and disease relationships in the Forest ecosystem contribute directly to the carbon and nutrient recycling process in dead plant residue and to the development of Forest soil organic layers. Insects and disease may have negative impacts on stands of trees. Younger, vigorous trees are more resistant to damage from insects and disease. Mature or old-growth trees tend to have the greatest incidence of disease. Trees inhabitated by insects or disease have reduced sound fiber for utilization as wood products. Other insect-disease relationships are responsible for mortality and retarding growth in Forest stands.

Historic Trends

Historically, the Forest's overall tree mortality from insects and disease has been moderate. However, scattered outbreaks with tree damage have occurred, usually following fire or blowdown. In 1953, 80,000 acres on the Forest were sprayed to control an outbreak of the Spruce Budworm. Insects, diseases, and their hosts have evolved together for centuries, each responding to changes in the other. Though antagonistic to individual plants, many insects and diseases are beneficial to the Forest ecosystem, acting as a natural and necessary component of the system as long as the system is in balance.

Insects, including bark beetles and wood borers, utilize fungi as their primary food base and contribute directly to the dispersal and effectiveness of these decay organisms. In the process of eating the fungi, the insects ingest spores which sometimes survive passage through their digestive tracts (Witcamp 1975). Tree pathogens such as root rotting fungi are dispersed through the Forest ecosystem in this way.

Physical stress, such as lack of moisture, light, or nutrients, predisposes plants to invasion by insects and certain diseases or pathogens. Moisture stress reduces the tree's ability to combat insect attacks. Insects and disease, that attack stressed trees can release the healthier and more resistant trees. The result is similar to a precommercial or commercial thinning.

There are primarily three insects which have caused significant timber losses in the Forest. These are: The Douglas-fir bark beetle (*Dendroctonus pseudotsugae)*; Mountain-pine beetle (*Dendroctonus ponderosae*); and the Balsam wooley aphid (*Adelges piceae*). Douglas-fir bark beetles are occasionally found in down Douglas-fir timber. Mountain pine beetles occasionally kill pines that are weakened by white pine blister rust, poor or changing site conditions. Balsam wooley aphid damage may occasionally be found in the true firs, particularly Pacific silver fir. An aggressive salvage program has kept insect damage at a minimum.

In many instances birds regulate insect populations locally (Buke 1974). Pileated woodpeckers forage for carpenter ants and termites that invade the heartwood of trees, while sapsuckers and hairy woodpeckers prey on larvae and pupae in the cambium layer. Adult bark beetles, spiders and ants are pursued by other insectiverous birds such as the brown creeper, and the white-breasted nuthatch (Evans and Conner 1979). These birds, bats, other small mammals, and microbes help hold insect populations at nondamaging levels or exert some control during early stages of outbreak. The Forest standards and guidelines for wildlife trees will help maintain viable populations of these valuable species throughout the Forest.

In 1984, an isolated and well-established gypsy moth infestation was discovered on about 5,000 acres of white oak, alder, and Douglas-fir on a ridge south of Oregon Highway 58 between Rattlesnake and

Williams Buttes in Lane County. The area is about 15 miles west of the Forest boundary. Some moths were also found on the southwest portion of the Lowell Ranger District. The gypsy moth has not been proven to be a major defoliator of Douglas-fir; its greatest impact will be on south aspects where oaks and other hardwood brush is abundant. On these habitats it has shown the ability to build up to high population levels and is suspected of defoliating minor amounts of needles of Douglas-fir along with the hardwood species (Miller 1986).

Immediately after this infestation was detected, the Oregon Department of Agriculture and U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) established a quarantine area to regulate and restrict the spread of the gypsy moth. Approximately 200,000 acres of the Forest were included in this quarantine area. All Forest products, including nursery stock, Christmas trees, lumber, firewood, and wood chips had to be certified as being free of gypsy moth life stages before being shipped from the regulated area.

Current Situation

All of the diseases that attack timber species in the Douglas-fir region are present on the Forest. Much of the old-growth timber has heavy defect from butt and trunk rots. Root rots often weaken trees making them subject to windthrow. Dwarf mistletoe causes considerable damage, loss of growth, and occasional death in hemlock and true fir stands. White pine blister rust is prevalent in western white pine and sugar pine.

As existing older stands are harvested from lands suited for timber management, the total Forest losses due to defect will be reduced. The biggest disease losses in the regenerated stands are and will continue to be caused by pockets of root rots, such as *Armillaria mellea* root disease, *Phellinus weirii* root rot, and *Ceratocystis wageneri* black stain root disease. Consideration is now being given to planting tree species more resistant to root disease where the root disease pockets have been identified prior to reForestation actions.

Black stain root disease can be spread by bark beetles and weevils which pick up the fungus while feeding on infested trees and transfer it to other trees. This is minimized by scheduling thinning treatments in June and July when the insects are inactive. The stumps then dry out and are not attractive to the beetles or weevils.

Current tree management and silviculture systems provide methods of control of insects and disease. Prescribed management practices include but are not limited to:

- Removal of disease-susceptible or infected trees.
- Introduction of rust-resistant western white pine and sugar pine.
- Salvage of beetle-infested or susceptible trees.
- The use of more resistant species in reForestation programs.
- Cutting and disposal of mistletoe-infected trees to prevent spread of this disease.
- Aerial reconnaissance for and detection of insect and disease problems to assure prompt and timely treatment.

- Timing cultural operations to minimize insect population increases.
- Enhancing habitat for predators that control insect populations.

The potential threat of the gypsy moth outbreak to Oregon's economy was significant. In 1980, the total Oregon timber product value was $4.4 billion. Receipts from National Forest lands in Oregon during 1984 totaled about $350 million. The Oregon nursery industry ranks third in producing woody nursery stock for shipment throughout the Nation and overseas. Nursery sales and Christmas tree sales in Oregon are valued at $215 million annually.

Through the aggressive effort of federal and state agencies, the outbreak was controlled by aerial applications of *Bacillus thuringiensis* (Bt), a bacterium that produces a toxin against the moth.

The quarantine was lifted in 1989 after 3 years of trapping with zero moths captured. Industry was able to adjust to the compliance procedures of the quarantine and the impacts were less than predicted.

Currently there is a small outbreak of Spruce Budworm in the Santiam Pass area, that has apparently spread from the Deschutes National Forest. The population is being monitored closely to see if pesticide use will be necessary.

Future Trends

Major outbreaks of insects or diseases are unpredictable. As timber is harvested, new pockets of disease will be discovered. Prescriptions will be implemented that will reduce the product loss in plantations. Perpetuation of some of these diseases is inevitable. Insects will cause damage in isolated areas and will probably be recurrent on cone crops. Current tree management and silviculture systems will continue as long as there practices effectively reduce loss of wood fiber and protect other resources.

The benefits of salvaging scattered mortality must be weighed against the reduction of wildlife tree habitat and large woody debris. Loss of this habitat along road corridors will require more green trees to be left in harvest units to maintain the overall watershed in an acceptable condition. Trees causing a safety hazard must be felled but their removal is not necessary.

ARTIFACTS AND SITES

Evidence of past human use of the land and resources within what is now the Forest remains in prehistoric (American Indian) and historical sites throughout the Forest. These sites, and scattered artifacts, make up the cultural resources from which information can be learned about former ways of life in the forest setting, of the Western Cascades.

Historic Trends

Human use of lands and resources in and around the Forest extends over an estimated 8,000 years. Previous American Indian inhabitants within or adjacent to the Forest at the time of historic contact include the Molala, Kalapuya, Tenino, and Northern Paiute. The Molala and the Kalapuya peoples wintered at sites along streams in the lower elevations of the Western Cascades and traveled to the higher elevations to hunt game, gather wild plant foods, and to collect toolstone (obsidian) and other necessities of primitive life. American Indian sites are documented throughout the Forest including toolstone quarrie, habitation sites and seasonal camps, trails, food gathering areas, peeled bark trees, rock shelters, and religious sites (Minor et al. 1987).

Euro-American settlers, miners, trappers, and loggers have used Forest lands and resources since the 1800s. Remnants of the historic (1805-1910) Euro-American use include trails, wagon roads, railroad grades, homesteads, cabins, sheep camps, and mines. The physical remains of early Forest administrative sites (1910-1940) include cabins, guard and Ranger Stations, trails, lookouts, and Civilian Conservation Corps (CCC) recreation and administrative structures.

Many prehistoric and historic sites have been lost or degraded due to environmental processes including weathering, erosion, tree fall, and fire. Historic buildings and structures are affected by weathering, insect infestation, moisture, and fire. Archaeological sites are affected by erosion and natural weathering.

Past experience has shown that cultural resources can also be lost directly through development of campgrounds and trail construction, logging and road construction, and indirectly through improving access which increases potential for vandalism and artifact theft. Occasionally, public use may result in the deliberate destruction of cultural properties through vandalism, relic collecting, theft, and carelessness. Losses of this type may increase in the future with increasing use of the Forest for a wide range of activities. The main protective measures used in the Forest have been to maintain the confidentiality of specific prehistoric site locations, to direct public use away from archaeological properties, and periodic monitoring of sensitive areas. Public education has been used to promote awareness and protection of prehistoric and historic sites.

A number of laws have been enacted to ensure the preservation of the Nation's cultural resources. Principal laws affecting the Forest are:

Preservation of American Antiquities Act of 1906
Historic Sites Act of 1935
National Historic Preservation Act of 1966
National Forest Management Act of 1976
National Environmental Policy Act of 1969
Archeological Resources Protection Act of 1979
American Indian Religious Freedoms Act of 1978
Federal Land Policy and Management Act of 1976
Executive Order 11593 (1971)

Guidelines in 36 CFR 800; 36 CFR 60, 63, 66; and 7 CFR 3100.
United States Forest Manual, Part 2360.
Historic Preservation Handbook

The National Historic Preservation Act, as amended, directs that cultural resources on federal lands be inventoried and evaluated. Project inventory, cultural site evaluations to determine *National Register of Historic Places* and various kinds of investigations including archeological data recovery evaluations are completed annually on the Forest. Enhancement and interpretation of cultural resources has not been accomplished as a regularly scheduled activity. Limited interpretation or enhancement has been accomplished for prehistoric properties to date. Future study will be done of both prehistoric and historic sites as regular program of activities.

Current Conditions

Over 1100 cultural resource sites have been identified in the Forest as of January 1990. Figure III-L-1 summarizes this data by Ranger District. One historic site, Independence Prairie Guard Station, is on the *National Register of Historic Places*. Some 200 evaluated historic and archaeological sites eligible for addition to the National Register. In addition, prehistoric and historic land use patterns suggest a high probability for the occurrence of other significant cultural resources within the Forest.

The Forests CCC era administrative and recreational structures are currently in the process of being nominated to the National Register of Historic Places. Included in this process are: Longbow, Trout Creek, and Clark Creek Organization sites; Breitenbush and Marion Forks Guard Stations; Fish Lake Remount Station and Santiam Lodge; Olallie Mt. and Carpenter Mt. Lookouts; and White Branch Lodge. In addition, the two historic wagon roads (Santiam Wagon Road and The Oregon Central Military Wagon Road) in the Forest are eligible for nomination to the National Register of Historic Places.

There are no known Native American burial sites located in the Willamette National Forest. The Confederated Tribes of The Warm Springs, Grande Ronde and Siletz, and The Cow Creek Band of The Umpqua are regularly consulted regarding Forest activities that are known or likely to affect prehistoric and historic sites. To date, no groups have expressed strong interests about specific prehistoric or historic sites or traditional use areas on the Forest.

The Forest has undertaken a program to identify, evaluate, protect, enhance, and mitigate adverse effects on prehistoric and historic resources within the Forest. The program has expanded from preliminary inventory of known significant prehistoric and historic resource sites to include field surveys of any areas in which proposed management will result in ground disturbance or an exchange of property. Cultural resource inventories consist of project area reconnaissance surveys to identify the presence or absence of cultural sites. The Forest currently inventories approximately 23,000 acres per year. The scientific or historical value or "significance" of all identified cultural resources is determined by evaluating the properties against the National Register criteria for evaluation (36 CFR 60.4). When there is insufficient information present to evaluate a prehistoric site, the Forest archaeologist coordinates a testing program usually consisting of subsurface excavation and scientific collection of artifacts.

Cultural resource compliance procedures, mandated by federal laws and regulations require on-going consultation with the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation and the Keeper of the National Register of Historic Places (National Park Service). When appropriate situations arise, the Forest also coordinates its cultural resource activities with those of adjacent federal land-managing agencies such as the National Park Service, the Bureau of Land Management, and the Army Corps of Engineers.

Table T015. Cultural Resource Information (III-L-1)

Ranger District	Number of Sites		Sites Tested[1]	Sites Eligible to NR [2]	Site Impacts Mitigated[3]
	Prehis-toric	Historic			
Rigdon	134	16	30	16	5
Oakridge	120	58	8	3	0
Lowell	98	37	13	10	1
Blue River	95	14	5	7	2
McKenzie	234	9	24	15	4
Sweet Home	237	20	20	18	6
Detroit	251	35	12	6	5
TOTAL	1,169	189	112	75	21

[1]Denotes sites where either full acheological testing or historic archival research occurs to determine the importance or "National Register" significance of site(s).
[2]National Register of Historic Places
[3]Adeverse affects to cultural sites by project activities are usually mitigated through project redesign and "avoidance". This figure denotes only those cultural sites subject to scentific "data recovery" excavations or historical recording as mitigation measures prior to partial or total site destruction by ground disturbing projects.

Future Trends

As the dimension of land development increases on private and public lands, a correspondingly greater proportion of the physical remnants of our American heritage and a large source of scientific and historical data will be irrevocably lost. As a result, the value of cultural sites on National Forest lands will increase with time. This intensifies the need to protect and manage this irreplaceable resource.

The anticipated demand for identification and use of cultural resources will likely be a function of four factors: 1. intensified timber management activities; 2. recreational use; 3. Native American religious or cultural use; 4. and the development and expansion of archaeological and historical research. The probability for loss of cultural resources increases as lands are allocated to uses involving land modifying activities. The degree of loss will depend upon the location and extent of land alteration.

Timber harvest can result in significant ground disturbance caused by roads, skid trails, and landing construction, yarding of logs, slash piling, and tree planting. At the same time, timber harvesting provides opportunities for identification and evaluation of previously unknown cultural properties. Field reconnaissance for cultural resources accelerates proportionally to the number of acres scheduled for harvesting. In heavily vegetated environments, the removal of understory and forest duff may provide the only means of locating archaeological sites.

Cultural resources will continue to be identified as more of the Forest is inventoried according to the Forest's inventory plan. This plan will enable archaeologists and cultural resource technicians to concentrate their inventory efforts in areas of high probability for the occurrence of artifacts and sites. Current efforts to identify where cultural resources are likely to be found in the Forest are documented

in a forest-wide inventory of occurrence probability. Figure III-L-2 displays the relative occurrence probability of artifacts and sites by landscape feature.

Table T016. Occurrence Probability of Artifacts and Sites (III-L-2)

Landscape Feature	Occurrence Probability			
	High	Moderate	Low	Total Acres
Water Related	218,675	--	--	218,675
Saddles/Knolls/Ridges/ Benches	78,110	--	--	78,110
Meadows/Ecotones	12,627	--	--	12,627
Valley Floors	12,307	--	--	13,307
Aspects - S, SE, SW	--	145,471	--	145,471
Other	--	--	1,208,217	1,208,217
TOTAL ACRES	321,719	145,471	1,208,217	1,675,407

Evaluation of cultural properties will likely remain constant in the near future, while mitigation, including site avoidance, will increase as more ground disturbing projects will be planned for areas with identified cultural properties. Enhancement and interpretation of prehistoric and historic resources has become a high priority in recent years (since 1987) as Forest inventories come near completion and as site evaluation and mitigation accelerate. A large body of information about the prehistoric and historical human use of the Western Cascades has been amassed as a result of these efforts. Consequently, in concert with broader Forest efforts, the Forest has embarked upon a program to enhance and interpret important and represenative cultural sites for public education and enjoyment (See activity schedule for enhancement and interpretation projects, Appendix D of the Forest Plan). This program will likely increase in importance in future years along with the Forest's recreational opportunities.

There are currently few data sources available to determine recreational use of cultural resources on the Forest. Enhancement and interpretation of historical properties would likely increase the demand for recreational use. An effort by th

RECREATION

The Forest offers a diversity of recreation settings ranging from developed sites to Wilderness. People participate in a wide range of recreation activities throughout the year. The most popular recreation activities in the Forest are camping, driving for pleasure, fishing, and boating-related activities. In 1982 participation in these four activities represented approximately two-thirds of the total recreational use in the Forest. Next in popularity were swimming, picnicking, hiking, and resort use.

The dispersed and developed recreation resources of the Forest serve to meet the varied recreational needs of its residents and are an important aspect of the area's economy.

Dispersed Recreation: Forest recreation that takes place outside of developed recreation sites is referred to as dispersed recreation. Areas of dispersed recreation opportunities are available throughout the Forest from a spectrum of landscape settings that range from the densely forested West Cascades to the meadow and lake dotted Cascade Crest. This spectrum of recreation opportunity settings provides the basis for users to engage in a variety of activities, including fishing, hiking, horseback riding, hunting, off-road vehicle (ORV) use, cross-country skiing, driving for pleasure, gathering Forest products, and nature study.

Developed Recreation: Opportunities are considered developed when a particular activity utilizes a structure, facility, or site that has been developed for recreation purposes. These opportunities are provided from an array of developed sites that vary widely in their degree of environmental modification and development. Sites range from downhill ski areas, to campgrounds where facilities are provided for the convenience and comfort of users, to primitive campsites where environmental modification is minimal and facilities are provided only for the protection of basic resources.

Recreation use is measured in Recreation Visitor Days (RVDs) which are used to quantify the amount of participation in various recreation activities. An RVD is equivalent to 12 person hours spent recreating on National Forest land; e.g., 12 hours spent by one person, 6 hours spent by two people, etc.

The primary purpose of managing recreation resources is to provide a range of opportunities from which National Forest users can obtain satisfying recreation experiences. To fulfill this purpose the USDA Forest Service uses a land classification system to inventory and describe a range of recreation opportunities called the Recreation Opportunity Spectrum (ROS). This system seeks to identify recreation settings of varying characteristics that range from large, remote, undeveloped areas to small, easily accessed highly developed sites. These settings are described in terms of five ROS Classes. (See Figure III-M-1 for a description of Classes.) Within this management framework, the traditional concepts of developed and dispersed, motorized and nonmotorized, and trail and nontrail recreation opportunities are interwoven.

Table III-M-1. Recreation Opportunities Spectrum Descriptions [1]

ROS Class	Descriptions
Primitive	Area is characterized by essentially un-modified natural environment of fairly large size. Interactions between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human induced restrictions and controls. Motorized use within the area is not permitted. Extremely high probability of experiencing isolation from the sights and sounds of humans. Independence, closeness to nature, tranquility, and self-reliance through the application of of outdoor skills in and environment that offers a high degree of challenge and risk.
Semiprimitive Nonmotorized	Area is characterized by a predominately natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is some evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. High probability of experiencing solitude, closeness to nature, tranquility, self reliance, challenge and risk. Access and travel is nonmotorized on trails, primitive roads, or cross country. Vegetative alterations; sanitation salvage units to be very small in size and few in number, widely dispersed and not obvious. No on site facilities except limited signing, sanitary and safety needs in native or rustic materials. Minimal to no site modifications. Interpretation through self discovery. Some use of maps, brochures, and guide books.
Semiprimitive Motorized	Area is characterized by a predominately natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted. Moderate opportunity for solitude, tranquility, and closeness to nature. High degree of self reliance, challenge and risk in using motorized equipment. Vegetation alterations very small in size and few in number, widely dispersed and not obvious. Limited facilities for signing sanitary and safety needs in native or rustic materials. Minimal site modification for facilities. Interpretation through very limited on-site facilites. Use of maps, brochures and guide books.
Roaded Natural	Area is characterized by a predominately natural-appearing environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities. Opportunity to affiliate with other users in developed sites but with some chance for privacy. Self reliance on outdoor skills of only moderate importance. Little challenge and risk. Some obvious on-site control of users. Access and travel is conventional motorized including sedan and trailers, RVs and some motor homes. Moderate site modification and amount and complexity of facilities for comfort and convenience of user. Interpretation through wayside exhibits. Use of primarilly native-like or rustic material with some refinement in design. Some casual interpretation from Forest staff.
Roaded Modified	Area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is low. Facilities may be provided for special activities. Moderate densities of use are provided for away from developed sites. Opportunity to get away from others but with easy access. Feeling of independence and freedom but with little challenge and risk. Substantially modified natural environment where roads, landings, slash, and debris may be strongly dominant from within, yet remain subordinate from distant sensitive roads and highways. Conventional motorized access including sedan and trailers, RVs & motor bikes. Little on-site controls of users except for some gated roads. No on-site facilities except signing at major road junctions and occasional sanitary facilities for user health protection. Interpretation by simple wayside signs of native or rustic materials may be provided.

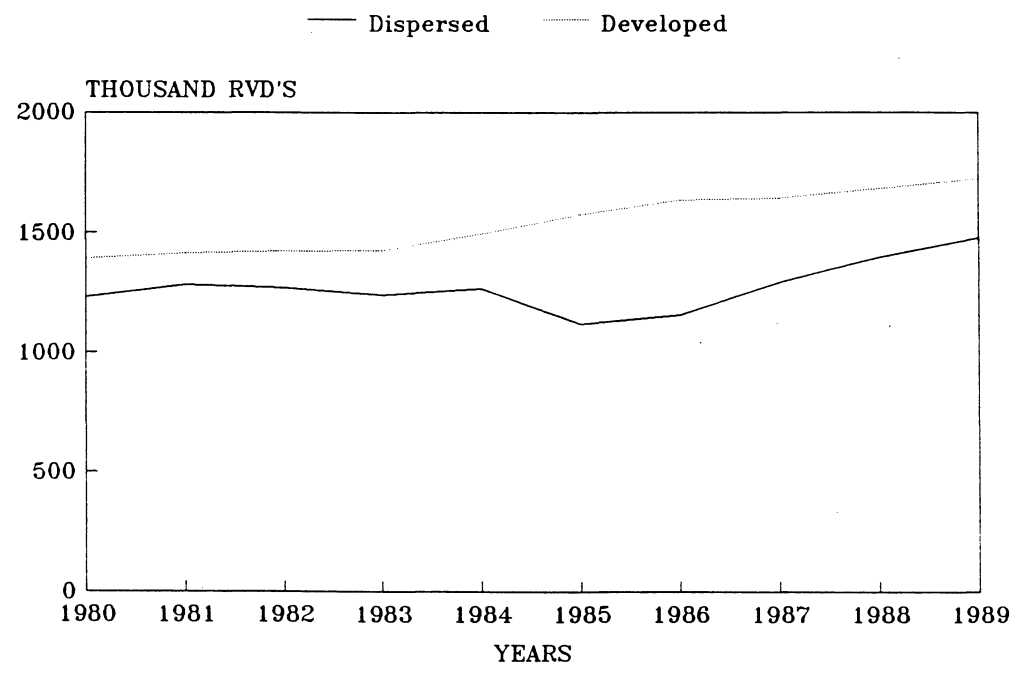
[1]Source: Pacific Northwest Region ROS Photo Poster.

Historic Trends

To determine the most likely rate of change in future recreation use it is necessary to examine trends in historical data. The primary source for visitor use data for the Forest is the Recreation Information Management (RIM) System. RIM files contain use data for specific activities and sites in the Forest. Similar RIM activities were combined into appropriate categories for analysis and display.

Analysis of RIM data from these activity groupings for the period 1980-89 revealed an average annual growth rate in recreation use for all activities of about 2.7%. See Figure III-M-2 for dispersed/developed use trends and Figure III-M-3 for trends of all activities. Although some fluctuations in use were noted between 1980-1989, clear trends of continued growth are evident in the data.

Figure III-M-2. Recreation Use in Thousands of RVDs[1]



Type of Use	1980	1981	1982	1983	1984	1985	1986	1987	1988[2]	1989[2]
Dispersed[3]	1,232.5	1,283.3	1,270.9	1,241.2	1,267.5	1,118.8	1,155.9	1,293.7	1,399.5	1,480.9
Developed	1,393.4	1,414.0	1,424.2	1,426.3	1,497.2	1,575.9	1,636.4	1,644.8	1,684.3	1,724.7

[1]Thousands of Recreation Visitor Days (RVD): 1 RVD = 12 hours of use.
[2]Estimates of Forest use based on historical use patterns.
[3]Does not include Wilderness use.
Source: USDA Forest Service, Recreation Information Management System (RIM).

Table III-M-3. Recreation Use for Selected Activities[1] [2](Thousands RVDs)

Activity	1980	1981	1982	1983	1984	1985	1986	1987	1988[3]	1989[3]	Average Annual % Change 1980-89
Camping	982.0	1,027.7	1,027.7	1,053.3	1,059.1	1,101.1	1,123.9	1,207.2	1,259.6	1314.3	+ 3.4
Driving/ Sightseeing	399.1	416.2	413.1	403.1	418.4	434.4	469.8	481.0	491.7	502.7	+ 2.6
Hiking	128.7	170.2	140.9	145.8	144.2	154.2	140.9	164.8	176.8	189.7	+ 4.7
Picnicing	166.8	168.0	145.0	152.6	162.6	163.2	173.2	174.4	179.8	185.4	+ 1.1
Boating/ Waterskiing	222.9	225.4	226.3	232.2	218.8	217.5	226.3	244.1	250.1	256.2	+ 1.5
Swimming	135.2	164.9	147.7	109.2	125.6	147.9	166.2	171.0	180.9	191.3	+ 4.2
Horseback Riding	23.3	24.3	24.1	26.1	24.3	28.8	28.6	28.4	29.8	31.2	+ 3.4
Downhill Skiing	21.0	4.2	22.5	26.8	36.6	49.0	40.8	50.9	51.9	52.5	+15.0
Cross Country Skiing	12.7	9.6	16.6	25.5	26.2	29.9	23.2	31.0	32.2	34.4	+16.3
Other Winter Sports	36.9	30.5	37.2	37.5	45.7	46.3	44.3	48.2	51.4	54.8	+ 4.9
Organization Camping	79.1	69.0	69.2	70.4	71.8	62.2	64.6	60.2	61.1	62.2	- 2.1
Resort Use	116.6	117.8	119.0	90.5	93.7	96.8	94.5	98.2	99.2	100.2	- 1.4
VIS	56.1	54.5	57.7	66.1	61.1	62.4	64.3	61.2	62.8	64.5	+ 1.5
Hunting	84.6	86.7	85.8	84.0	84.4	89.1	85.8	99.5	102.8	106.2	+ 2.6
Fishing	261.5	233.4	260.7	256.4	253.4	266.9	274.4	297.2	307.6	318.3	+ 2.2
Other	65.8	85.3	93.8	94.1	99.9	101.8	93.8	80.7	83.5	86.4	+ 3.2
TOTAL	2,792.3	2,887.7	2,887.7	2,873.6	2,926.2	3,053.9	3,114.1	3,268.0	3,421.2	3,551.1	+ 2.7

[1]Source: USDA Forest Service, Recreation Information Management System (RIM).
[2]Includes use attributed to Wilderness.
[3]Source: Estimates of Forest use based on historical use patterns.

During the 1980-1989 period, participation in most recreation activities increased at varying rates with some noticeable peaks, valleys and plateaus in the trend lines. It seems evident from the figures that recreation use was affected by such variables as weather and travel costs. Although use in most activities showed some decline during the 1980-1989 period total use has increased steadily. Total use did not change from 1981-1982. This may be due in part to the econmic resession the region was experiencing, although there was dramatic increases in use for some activities.

Two activity groupings show a decrease in participation over the 10 year period: organized camping and resort use. Hiking and picnicing use dropped dramatically in 1982 and have only recently regained their 1982 participation levels. Swimming use follows a similar pattern. Between 1982 and 1985, swimming use decreased significantly. Since that time, it has risen to approximately the 1981 level and has shown increases over the last four years.

Current Situation

Access to the Forest is provided by four highways, U.S. Highway 20 and State highways 22, 126, and 58. From these highways, Forest roads branch out to the many points of interest and recreation opportunities. From the Forest roads many trails provide access to remote, undeveloped recreation opportunities.

People from many western Oregon counties, other states, and even other nations visit the Forest. Lane, Linn, and Marion County residents are the most frequent users of the Forest, although Benton, Polk, and Yamhill counties, the Portland metropolitan counties of Clackamas, Multnomah, and Washington, as well as Deschutes County to the east, all contribute many recreationists.

Total recreation use in the Forest is split almost evenly between developed sites and dispersed areas (including Wilderness). The wide variety of sites and settings available provides opportunities for everyone to participate in many different activities and have meaningful recreational experiences.

Recreation Activities: Approximately 80% of the Forest's camping use occurs at developed sites. Nearly one quarter of all developed recreation site use occurs at Detroit Lake State Park, a site managed by the State of Oregon under special use permit. Other high use campgrounds include Paradise, Coldwater Cove, Ice Cap Creek and Big Lake.

About half of the driving and sightseeing activities occur on the major Forest roads in the High Cascades of the McKenzie and Oakridge Ranger Districts. The mountain pass roads are extremely popular for this type of activity.

Some of the reservoirs in the Forest receive heavy boating and swimming use during the summer months. Over 40% of reservoir boating use occurs on Detroit Lake with another 30% on Hills Creek Reservoir. Lakes receiving heavy boating use include Big Lake, Clear Lake, and Lost Lake in the McKenzie Ranger District. These reservoirs and lakes also receive a large portion of the swimming use, both at developed sites and nondeveloped areas along the shore. The remainder (over 40%) of the swimming activities takes place along the rivers and streams flowing through the Forest. The Fall Creek area in the Lowell Ranger District accounts for over half of this type of use. Fishing use in the Forest is divided almost equally between lakes/reservoirs and rivers and streams. Heaviest river and stream use occurs in the Detroit (North Fork of the Santiam and Little North Fork of the Santiam River), Rigdon (Middle Fork of the Willamette), and McKenzie (McKenzie River) Ranger Districts. Lake and reservoir fishing use is heaviest on Detroit Lake and the high elevation lakes on the McKenzie District.

Over 80% of the hiking in the Forest takes place on the Forest trail system. Much of this occurs in the Detroit and McKenzie Districts which together contain 65% of the Wilderness and 30% of the nonwilderness trail mileage in the Forest. Over half of the general undeveloped area hiking occurs in the Rigdon and Blue River Districts. Cross-country hiking without trails makes up about 20% of the hiking experiences on the Forest.

An emerging dispersed recreation activity on the Forest is Mountian Bike use. Mountian Bike enthusists are becomming organized as an group with a desire to cooperate in identifying Mountian Bike use opportunities on the Forest. Currently several trails have been identified as being ideal for this use.

Nearly 65% of all hunting in the Forest is for big-game animals--primarily deer and elk. Another 20% is for small game with the remainder for upland birds and waterfowl. Two-thirds of the big-game hunting occurs in the Detroit, McKenzie, and Oakridge Districts while nearly 70% of the small game hunting occurs in the McKenzie District.

Many of the other recreational activities in the Forest take place at specialized developed sites. Picnicking, resort use, downhill skiing, visitor information services, and much of the cross country skiing fall into this category. Others activities such as horseback riding, nature study, mountain climbing, and gathering Forest products occur primarily in dispersed areas.

Dispersed Recreation: Opportunities for dispersed recreation are available from nearly all land and water areas within the Forest. The type and quantity of dispersed nonwilderness recreation opportunities have been identified through the Recreation Opportunity Spectrum (ROS) inventory process. The inventory, through the use of specific criteria, classifies the Forest landscape into categories that identify a spectrum of recreation opportunity settings. In Figure III-M-4 a summary of acreages, trail miles, and Recreation Visitor Day (RVD) capacity is displayed for each recreation opportunity settings located in the Forest. The spatial distribution of these opportunity settings is illustrated in map form by Figure III-M-5.

Of the four recreation opportunity types that occur in the Forest, the semiprimitive motor and nonmotor are in shortest supply, as they comprise 19% of the Forest's nonwilderness dispersed recreation opportunities. These opportunity types are coincident with Inventoried Roadless Areas and other unroaded lands. Inventoried Roadless Areas, discussed later in this chapter, together with other unroaded lands (less than 5,000 acres in size) comprise the land base from which the Forests semiprimitive dispersed recreation opportunities are derived as illustrated in Figure III-M-5.

Table III-M-4. Nonwilderness Dispersed Recreation Opportunities [1]

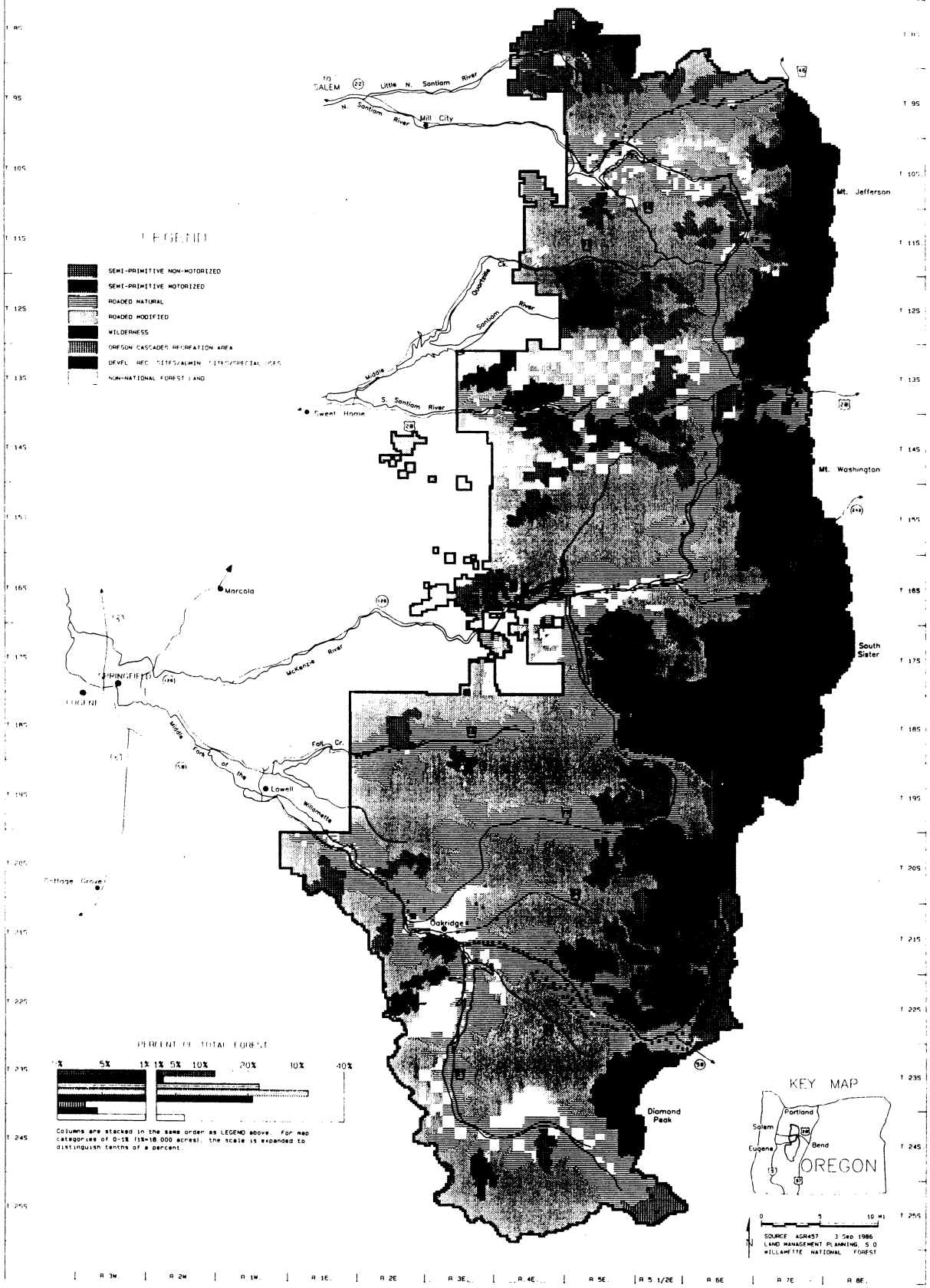
Data Categories	Primitive	Semiprimitive Nonmotor	Semiprimitive Motor	Roaded Natural	Roaded Modified	Totals
Acreage [2]	0	205,335	43,300	437,615	600,120	1,286,370
Trail Mileage	0	280.7	60.5	248.3	124.2	713.7
RVD Capacity	0	125,084	67,378	2,954,146	1,686,858	5,833,466

[1]See Planning Records for documentation of ROS Inventory criteria and process.
[2]Acreages include the Oregon Cascades Recreation Area but exclude developed recreation sites, special use and administrative sites and designated Wilderness.

Figure III-M-5.

WILLAMETTE NATIONAL FOREST

Dispersed Recreation Opportunities



Oregon Cascades Recreation Area: One unique nonwilderness area in the Forest which provides semiprimitive recreation opportunities has been reserved by Congress for recreation purposes by the Oregon Wilderness Act of 1984. This area spreads over adjacent lands of the Deschutes and Umpqua National Forests.

The Oregon Cascades Recreation Area (OCRA) was established by Congress ". . . to conserve, protect, and manage, in a substantially undeveloped condition, certain National Forest System lands in the State of Oregon having unique geographic, topographic, biological, ecological features and possessing significant scenic, wildlife, dispersed recreation, and watershed values . . . within the Umpqua, Willamette, Winema, and Deschutes National Forests . . . "(Oregon Wilderness Act of 1984).

The Forest portion (6,122 acres) of the OCRA (84,278 acres) is located in the Timpanogas Basin about 45 miles southeast of the city of Oakridge. This area includes the headwaters of the Middlefork of the Willamette River and ranges from 5,200 to 7,664 feet in elevation. Most of the area is a true fir/mountain hemlock forest type dotted with numerous small lakes.

Both dispersed and developed recreation opportunities exist in the basin, consisting of two nonfee campgrounds and 20.2 miles of developed hiking trails. Both developed campgrounds, Indigo Lake and Timpanogas Lake have a use season of June 15 to October 15 with peak use occurring in August and September. Timpanogas Lake (10-unit campground) is accessible by a high standard gravel surface road while Indigo lake (two units) requires a 1.5-mile hike.

Dispersed recreation in the OCRA is primarily confined to the trail system consisting of both hiker and off-road vehicle uses. Much of the use originates from either Timpanogas Lake Campground or the Pacific Crest Trail. Motorized use in the OCRA is limited to the existing trail system except for over the snow vehicles.

The OCRA is being managed under a seperate management plan prepared in accord with and subsequent to enactment of the Oregon Wilderness Act of 1984, which has been in effect since February 2, 1989.

Wild and Scenic Rivers: The Forest also provides for a wide range of dispersed recreation activities within two designated Wild and Scenic Rivers: the McKenzie River, from Clear Lake to Scott Creek and the North Fork of the Middle Fork of the Willamette River from Waldo Lake to near West Fir, Oregon. These designated rivers were established by congress in the Oregon Ominbus Wild and Scenic Rivers Act of 1988. Both river corridors provide for extensive hiking opportunities, dispersed and developed site camping, white water boating, fishing, hunting, and other natural resource appreciative activities. A complete description of these and other potential Wild and Scenic Rivers are included in the Wild and Scenic Rivers section in this Chapter and in Appendix E of the FEIS.

Trails: The Forest trail system is the basic off-road facility that dispersed recreationists, such as hikers, horseback riders, hunters, and motorized trail bikes and mountian bike enthusiasts utilize to access and traverse many areas of the Forest. The Forest's trail system includes a total of 714 miles of nonwilderness trails. Three National Recreation Trails, and portions of the Pacific Crest National Scenic Trail are included. Figure III-M-6 displays Forest trail mileages by trail type.

The capacity of the Forest to provide additional trail facilities and enhance trail related use in nonwilderness areas is represented by an 81% expansion potential of the existing trail system mileage. Refer to Figure III-M-6 for a display of potential trail mileage.

Table III-M-6. Nonwilderness Trail Mileage

Trail Type	TRAIL MILEAGE		
	Existing Trails	Potential Trails	Total Miles
Forest Trails	644.1	569.1	1,188.8
National Recreation Trails[1]	46.3	7.5[2]	53.8
Pacific Crest National Scenic Trail[1]	23.3	0.0	23.3
TOTAL	713.7	576.6	1,265.9

[1]Trail segments occurring outside of established Wilderness areas.
[2]Both the Breitenbush and Fall Creek NRTs are proposed to be extended.

Off-Road Vehicles: Off-road vehicle use opportunities are currently available from 71% of the Forest. The remaining 29% is closed to or restricted from ORV use due to topography and safety, potential disruption of wildlife habitats or damage to basic natural and cultural resources, or conflicts with other existing or potential uses. ORV use opportunities are generally available within Roaded Modified, Roaded Natural, and Semiprimitive Motor ROS Class categories. Much of the area identified in the ROS inventory of dispersed recreation opportunities may not be desirable for certain types of ORV use due to slope, dramatic terrain variations, vegetation density, or lack of trail access. ORV opportunities within these ROS Classes may be subject to further adjustment based on these consideration. ORV use is allowed on 63% of the nonwilderness trail system mileage in the Forest. This type of use is projected to increase, which will result in the need for more ORV dispersed recreation opportunities.

Developed Recreation: Existing opportunities for developed recreation are available from 174 Forest Service managed sites and 30 sites managed by the "private sector" under Special use permits. The 204 total sites have the combined capacity to accommodate 2,538,714 Recreation Visitor Days (RVDs) annually. These sites have a combined estimated capacity to accommodate 25,318 persons-at-one-time (PAOT). The distribution of sites by ROS Class is illustrated in Figure III-M-7.

Potential developed recreation opportunities can be made available from a wide variety of sites within the Forest. These potential sites have been identified by field specialists from each Ranger District utilizing such criteria as accessibility, slope, attractiveness, and proximity to water, as well as to other attractions or use areas. This inventory process identified 193 sites with an estimated capacity of over 3.5 million RVDs. Sites from this inventory provide the basis to increase use opportunities for site types that may reach capacity before the year 2040.

Table III-M-7. Developed Sites by ROS Class[1]

Kind of Site	Number of Sites by ROS Class					Total No. of Sites
	P	SPN	SPM	RN	RM	
Observation Sites	--	1	--	9	--	10
Boating Sites	--	--	1	21	2	24
Swimming Sites	--	1	--	6	--	7
Trailheads	--	--	--	14	4	18
Campground - Family	--	2	6	60	3	71
Campground - Group	--	--	--	3	--	3
Picnic Ground	--	--	1	14	3	18
Hotel, Resort, Lodge	--	--	--	3	--	3
Organization Camp - FS	--	--	--	2	--	2
Organization Camp - Private	--	--	--	7	--	7
Concessionaires	--	--	--	2	--	2
Recreation Residences	--	--	--	10	--	10
Ski Areas	--	--	--	--	2	2
Winter Sports Areas	--	--	--	11	--	11
Documentary Sites	--	--	--	1	--	1
Interpretive Sites	--	--	--	13	--	13
Information Sites	--	--	--	2	--	2
Total Number of Sites	0	4	8	178	14	204

[1]Includes both public and private sector sites.

Future Trends

Future recreation use in the Forest will likely be affected by changes in various socio-economic indicators (e.g., population growth, disposable income, leisure time), the availability of opportunities, technology, weather conditions, and other variables. Due to large uncertainties about the variables affecting future use, use projections become more tenuous as they are extended further into the future. Studies which have developed future growth projections for recreation cannot anticipate fluctuations in weather patterns nor predict events such as a world energy crisis or economic recession. Their projections generally assume that an underlying demand is present and will increase with a growing population that has an ever-increasing awareness and appreciation of recreation values. Based on these factors and the general trends in past use in the Willamette Forest, it seems appropriate to assume that future participation in all activities in the Forest will increase as long as opportunities are provided.

To determine future participation rates for all activities in the Forest, recreation activity projection rates of three separate studies were reviewed. During prreparation of the DEIS projection rates of the State Comprehensive Outdoor Recreation Program-Oregon; Projections of Future Forest Use, USDA Forest Service, 1979; and Pacific Northwest River Basins Commission, 1979 were compared. The annual growth rates for recreation use developed in the River Basins Commission study were selected for making use projections in the development of the DEIS and Draft Forest Plan because they most closely approximated trends in the Forests historical (1973-1982) use data. They were also the highest projection rates of the three studies and thus, indicated the upper level of use which could be expected in the year 2000.

However, since release of the DEIS and Draft Forest Plan, more recent studies of user preferences and use projections for a wide range of recational activities have been completed. In addition historical

use data for the Forest has been updated for more accurate comparisons with use projections of recent studies. In 1987 the Pacific Northwest Outdoor Recreation Study (NORS) was completed and in 1988 a draft of the State Comprehensive Outdoor Recreation Plan (SCORP) for Oregon was issued. The NORS study is a regional approach to integrated recreation planning and management among public agencies and is directly related to SCORP processes of participating states. The NORS study included the states of Washington, Oregon and Idaho.

The SCORP for Oregon utilized NORS results from the Oregon Survey portion of the study. Further Oregon's SCORP subdvides the state into geographic regions for purposes of recreation planning. The Willamette Natonal Forest is included in the State's Mid-Willamette Valley Region (Region 8). Oregon's SCORP provides recreation use projection rates for activity groups for each of it's regions. Average annual growth rates for activities within SCORP Region 8 for 1991 to 2010 are displayed in Figure III-M-8.

The annual growth rates for recreation activities presented in the draft SCORP and developed through the NORS study were selected for making use projections for the Forest's FEIS and Forest Plan. Use projections for the Mid-Willamette Valley, SCORP Region 8, closely approximate the Forest's historical use trends for the period 1980-1989. They were selected for use because they exceed SCORP projection rates on a state-wide basis, are specific to the Forests primary area of influence, are the most current projection rates available, and are also the highest projection rates of all studies reviewed and thus, may show the upper level of use expected in the year 2010.

Selecting an appropriate growth rate for recreation participation beyond the year 2010 is more difficult since there are few projections of the underlying factors affecting these activities. An annual average rate of 1.4% for the period 2011-2040 is assumed for the Forest. This rate represents an extension of Bonneville Power Administration (BPA) forecasts of electricity consumption in the Pacific Northwest (Appendix I, Economic/Demographic Projections, May 1982), projected population growth rates for the Pacific Northwest and the State of Oregon.

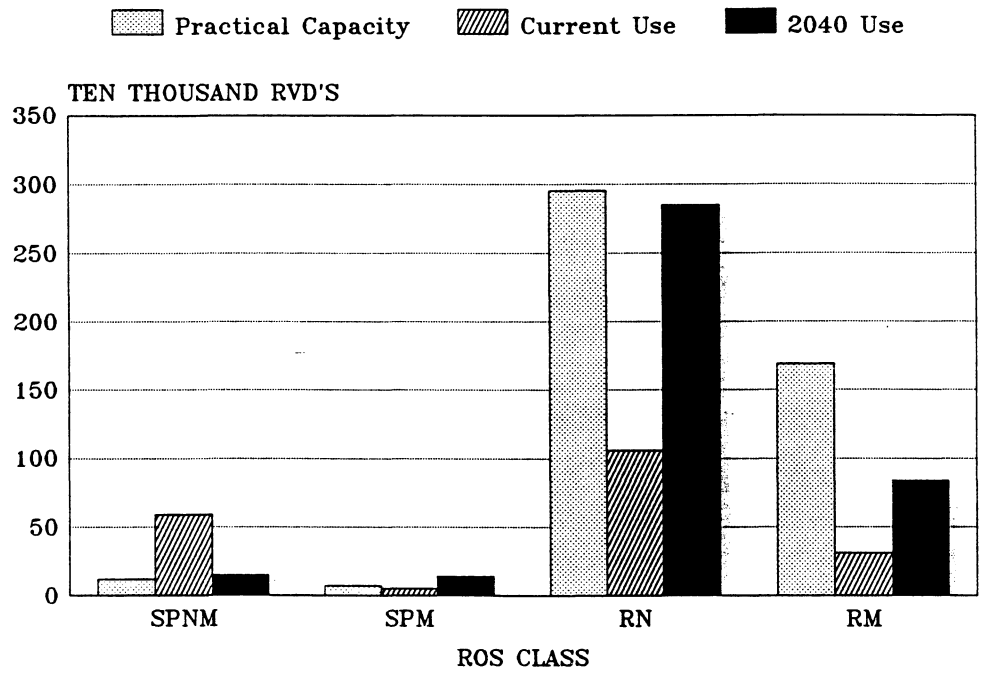
Table III-M-8. Recreation Projection Rates

Activity Group	1991-2010 Rate[1]	2011-2040 Rate[2]
Cammping	3.7	1.40
Driving/Sightseeing	4.9	1.40
Hiking/Walking	4.1	1.40
Picnicking	3.8	1.40
Boating/Waterskiing	5.5	1.40
Swimming	4.2	1.40
Horseback Riding	1.7	1.40
Downhill Skiing	2.6	1.40
Cross Country Skiing	2.8	1.40
Other Snow Activities	3.1	1.40
Organized Camping	1.0	1.40
Resort Use	1.0	1.40
Visitor Information	2.5	1.40
Hunting	2.5	1.40
Fishing	2.5	1.40
All Other Activities	2.5	1.40

[1]Source: Oregon State Comprehensive Outdoor Recreation Plan (SCORP)-Draft 1988. Activity groupings listed in SCORP were grouped according to the categories shown above. Projection rates for this time period represent a moderate scenario of future use for SCORP's Mid-Willamette Vlley Region 8.
[2]Source: Bonneville Power Administration 1982. Forecasts of electricity consumption for the Pacific Northwest.

Dispersed Recreation: Use of nonwilderness dispersed recreation areas has averaged 41% of the total recreation use in the Forest over the past decade. In the past there have generally been adequate use opportunities in terms of quantity of various ROS settings for most dispersed activities. Demand for dispersed recreation is estimated by applying growth projection rates to dispersed activities to obtain total use by time period. The subsequent disaggregation of total dispersed use to ROS Classes is based on observed patterns of activity participation in relation to Forest recreational settings. Although the science of estimating or proportioning demand by ROS Class is somewhat less than exact it affords comparison with existing and potential supply categories. Figure III-M-9 compares the practical RVD capacities by ROS Class for the existing inventory of dispersed recreation areas with 1989 and 2040 projected use.

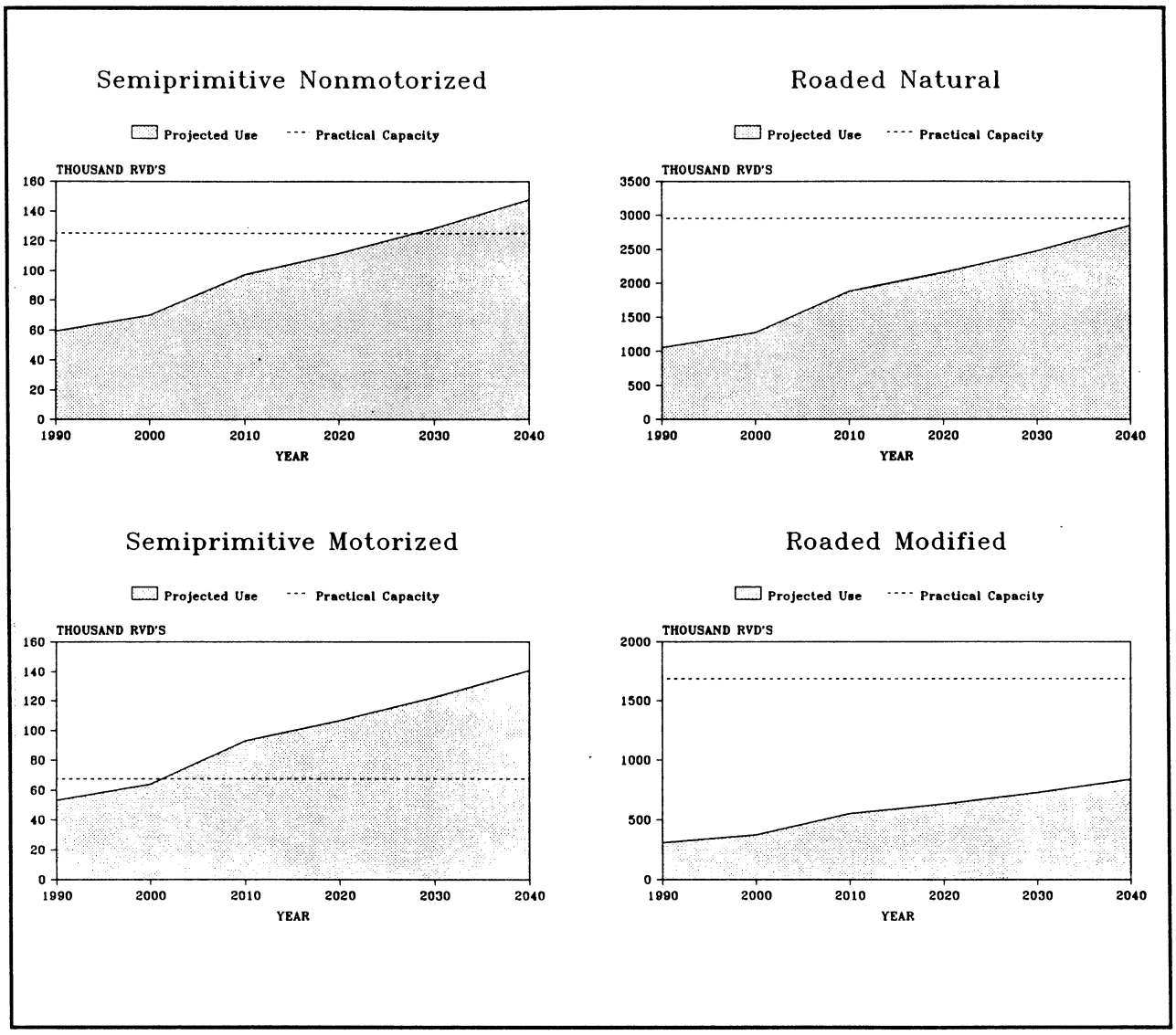
Table III-M-9. Comparison of Dispersed Recreation Capacity and Use



ROS Class Use	Acres	Practical RVD Capacity	Current RVD Use	2040 RVD USE
Semiprimitive Nonmotor	205,335	125,084	59,300	147,800
Semiprimitive Motor	43,300	67,378	53,100	140,900
Roaded Natural	437,615	2,954,146	1,056,300	2,852,700
Roaded Modified	600,120	1,686,858	311,600	839,200
TOTAL	1,286,370	4,833,466	1,480,300	3,980,600

Total dispersed practical capacity for the Forest far exceeds projected total use levels through 2040. This relationship, however, is not consistent among all ROS Classes. Uses which depend upon a semiprimitive setting face a decreasing supply of opportunities as lands are converted from an unroaded state. Unroaded areas which undergo intensive timber harvesting and accompanying road construction will lose those attributes that provide the solitude and undisturbed environment associated with semiprimitive recreation experiences. Even if existing inventories of semiprimitive opportunities were maintained, future demand is expected to exceed capacity by the year 2010. Figure III-M-10 displays projected recreation use by ROS Class and provides an indication of when future use may exceed practical capacity for the Forest.

Figure III-M-10. Projected Dispersed Recreation Use by ROS Class



Developed Recreation: Developed recreation opportunities are provided through a wide variety of site types in the Forest. The practical capacity for each site type in the Forest is compared with projected use in Figure III-M-11.

Developed recreation use for twelve types of sites, and for the Forest as a whole is expected to exceed existing practical capacity before the year 2020. Of these twelve site types, two are supplied primarily by the private sector: resort hotel/lodges, and private organization sites. The demand for organization sites can be met from the potential supply in the Forest regardless of whether they are managed by the public or private sector. There are also enough potential resort hotel/lodge sites in the Forest to meet future demand. However, these site types would be developed and operated almost exclusively by the private sector. At this point, it is difficult to predict if economic conditions will exist to make future investments in these sites attractive.

Table III-M-11. Developed Site Capacity and Use in RVDs

Site Type	Existing Practical Capacity	Projected Use in Year 2040	% of Use Supplied
Observation	39,052	52,201	75
Boating	263,036	463,298	57
Swimming	32,840	250,800	13
Trailheads	111,186	245,200	45
Campgrounds - Family	1,212,904	2,265,255	54
Campgrounds - Group	34,332	51,908	66
Picnic	133,510	333,509	40
Hotel, Resort, Lodge	54,340	176,500	31
Organization - Public	18,980	22,000	86
Organization - Private	81,160	87,600	93
Concessionaire	17,248	54,175	32
Recreation Residences	158,660	158,660	100
Ski Areas	238,096	117,100	203
Winter Sports Area	97,456	61,300	158
Visitor Information Services	45,914	141,800	32
TOTAL	2,538,714	4,481,300	57

Of particular importance is the demand for downhill skiing facilities as expansion plans for one area have received intense public scrutiny. As shown in Figure III-M-11, increases in downhill skiing use do not exceed the total practical capacity of the Forest's two ski areas -- Hoodoo Bowl and Willamette Pass. This relationship holds true for each area individually as well as on a combined basis.

The theoretical capacity for ski areas is determined by skiable acres times skier density by level of skiing ability. It is assumed that a ski area is operating at capacity for the entire use season. Ski area use, however, is not even throughout the week. On peak use days (i.e., weekends and holidays) overuse can occur, with the limiting factor usually being the uphill or lift capacity of the area. Thus, if lift capacity becomes limiting on too many days of a particular season, the theoretical capacity may be an overstatement of the actual use capacity.

Therefore, rigid use of theoretical capacity limits may not be entirely appropriate to determine when expansion should occur for some ski areas. The projected use shown in Figure III-M-11 is in visitor days. The privately operated facilities base their planning more on the number of people, or in the

case of a winter sports area the number of skiers, at one time rather than the number of visitor days that can be provided.

Typically a skier visit includes six or fewer hours of actual skiing during their normal visit to a ski area. Since in most cases the uphill lifts are only operated for about seven hours per day the actual capacity of a winter sports area is more likely to be about 30% of the theoretical capacity, rather than the 40% figure that is provided in Figure III-M-11. Therefore, in order to realize the projected 117,100 visitor days use shown for the year 2040 in Figure III-M-11, the two ski areas on the Forest would need a total number of visits that exceeds 235,000 skiers during a season.

Ski areas also expand to disperse skiers more evenly, as well as to capture periodic increases in use. Accessing new terrain may attract new skiers to the area, permit longer operating seasons, and provide some protection against years with limited snow. These and many other supply and demand related factors (e.g., costs, revenues, and effects on local communities) are carefully evaluated by both the private investor and the Forest Service before any development decision is made on public land.

The service level or types of amenities provided at a developed site can affect demand. While demands exist for all different types of services, there appears to be a growing desire from a more urban-oriented population for facilities which provide more than the basic amenities including the opportunity to participate in multiple and varied activities.

For developed recreation, future use levels can be accommodated to varying degrees by expanding existing capacity for specific types of sites which are likely to experience the projected increases. The availability of substitutes off forest is not taken into account in the projections. This, plus quality-related and other management variables such as the length of managed use season, types of service provided, public versus private sector management, and the charging of fees at public sites can all affect the amount of future use.

The point in time when future use will exceed capacity, if at all, will be different for each site type. This implies that the supply of some site types can and should be increased at various points during the 50 year planning horizon.

Dispersed and developed recreation areas and resources interact with, and are affected by, other resource management activities and natural events. Some management activities, such as wildlife habitat and riparian zone management generally have no adverse effect on recreation settings. In fact, these activities can provide long term beneficial effects to the recreation resource such as improved fishing and wildlife viewing opportunities. However, other activities such as timber harvest, road construction, and fire management may have an opposite affect on recreational settings.

Wildfire suppression activities, such as the construction of firelines, can introduce human modifications into dispersed recreation settings. On the other hand, fire can have a beneficial affect by reestablishing or perpetuating plant and animal diversity within recreation settings.

Trails are affected most by industrial operations and road construction. Logging operations can inhibit trail travel and make it an unpleasant experience. Another important interaction is between different types of trail users. Large groups are generally incompatible with individuals seeking isolation and quiet. Firearms and dogs can be offensive to many users. Off-road vehicle (ORV) users can affect other types of recreation use. Their use can produce noise impacts over large areas and their mobility increases potential to encounter groups and other users unexpectedly. Their use in high elevation Forest zones may also cause damage to vegetation and fragile soils.

Developed recreation is least compatible with Forest industrial operations such as logging and mining and most compatible with Forest management that emphasizes other resources such as wildlife, water, and scenery. Developed sites are vulnerable to vandalism and to the effects of increasing use. Budget reductions may inhibit maintaining facilities for the levels of use they may receive, resulting in increased site compaction, loss of vegetation including large trees, and a general worn-out appearance of facilities. Potential sites are affected most significantly by other Forest uses that may permanently alter the suitability or availability of an area for recreation development.

SCENERY

The landscape of the Forest is composed of dense coniferous vegetation, varied terrain, an abundance of geologic features, lakes and rivers, wildlife, and snow-capped mountain peaks which together form an outstanding scenic resource. This resource provides a broad range of natural and managed scenic experiences for both local and distant visitors.

The quality of the Forest's scenic resource is important to the local tourist industry as well as the Pacific Northwest. Many residents of the southern Willamette Valley, and beyond, through their recreational pursuits, seek an overall natural appearing landscape in contrast to their normal surroundings of urban streets and agricultural lands. The scenery of the Forest is an important asset to the local communities which are attempting to diversify their economic base in an effort to recover from recent declines in the wood products industry.

Historic Trends

The scenery of the Forest is characterized by two distinctive geologic provinces or landscape character types; the Western Cascades and the High Cascades. Each landscape character type is a broad geographical area that exhibits throughout its extent similar features of landform, rock form, vegetation, and water form. Although landform is usually the most significant feature, all features combine to create a certain visual image of the character type.

The Western Cascades landscape character type is oriented in a north-south direction and occupies the western two-thirds of the Forest. The High Cascades character type, also oriented in a north-south direction, occupies the eastern one-third of the Forest. A map of the geologic provinces of the Forest is located in Chapter III, Geology.

The Western Cascades type is characterized by a general conformity in ridge crests separated by deep valleys with moderately steep, highly dissected, side slopes. In the southern portion of this type, the major valleys are V-shaped. Glacial features are evident, but not pronounced throughout the area. Some rock cliffs and rock outcrops exist. Vegetation is characterized by dense stands of large trees including western hemlock, Douglas-fir, and true fir. Most areas have a continuous cover of overstory and understory vegetation. Deciduous species such as alder and maple are often intermixed along drainages. Some meadows are found in both lower and upper elevations.

A wide variety of rock formations exists in the area but most are hidden by the dense vegetative cover. Some extensive bare rock ridges and volcanic plugs stand out above the vegetation, and old volcanic lava flows are sparsely vegetated. Water bodies, particularly lakes, ponds, and marshes are scarce within this character type. Other waterforms consist of streams and major rivers, all of which drain into the Willamette Basin.

The visual experience of Forest visitors in this landscape type is characterized by views that are focused or directed at points or features in the landscape by road and trail side vegetation or landform structure. To a lesser extent, visitors will also experience landscape spaces enclosed by a continuous physical barrier of trees, hills, or mountains.

The High Cascades landscape character type consists of a volcanic plateau capped by shield volcanoes, cinder cones, and other volcanic forms such as lava flows of various ages. All these landforms are in various stages of disintegration. It is essentially an area of rolling terrain, but interrupted at intervals by glaciated channels in the major drainages. The area is dotted with a chain of volcanic peaks and

cones which rise above the surrounding landscape. Much of the landscape is mantled with pumice and volcanic ash. Vegetation is characterized by both dense and open stands of conifers. Usually with sparse understory, western portions are dominated by Douglas-fir, hemlock, and true fir while eastern portions have mostly mountain hemlock and lodgepole pine. In higher elevations there are meadows with lush stands of alpine and subalpine vegetation.

Rock forms are numerous and significant in the landscape. Most rock forms are volcanic in origin, either glaciated volcanic peaks, lava flows, or talus slopes. Some deep, glaciated canyons exhibit extensive rock cliffs on their steep side walls. A wide variety of water bodies dot the landscapes including marshes, lakes, streams, and rivers. Many of the lakes and small streams are the headwaters for rivers flowing west to the Willamette basin.

The visual experience of Forest visitors in this landscape type is characterized by broad panoramic views encompassing considerable distance, also dominated by a single landscape feature or group of features. Visitors will also experience, however to a lesser extent, areas of open space enclosed by a continuous physical barrier of trees, hills, or mountains.

Change in the Forest's landscapes in recent centuries was due primarily to wildfires, but since the early 1900s, noticeable change has been due to a variety of land and vegetation altering activities, such as road and railroad construction, timber harvesting, and dam building, as well as wildfires. Human-caused changes are most apparent in the Western Cascades character type, as evidenced by a mosaic of harvest areas in various stages of regeneration. In the face of this landscape change, Forest managers recognized and sought to manage portions of the landscape for its scenic value by establishing water and travel influence zones.

However, not until recent years have the quality and the characteristics of the scenic forest landscape actually been described and inventoried. Since 1973 the visual resources of the Forest have been described through the use of four inventories integral to the National Forest's Visual Management System (VMS) including: Viewshed Corridors (VSC); Visual Resource Inventory (VRI); Visual Absorption Capability (VAC); and Existing Visual Condition (EVC).

The Visual Management System (VMS) is the primary means for planning and management of the Forest's scenic resources. Through use of this system, project designers seek to maintain the visual quality of the Forest's scenic resources, based on their inherent value, prominence, and public interest. Now adopted throughout the U.S. Department of Agriculture--Forest Service, the VMS enables Forest managers to integrate the principles of landscape management into multiple-use resource planning. The system sets forth procedures that enable managers to identify and classify the visual characteristics of the Forest landscape establish scenic resource objectives and simulate and analyze the visual effects of proposed resource management actions.

To meet the public's long-term expectations for scenic quality, the rate at which change is introduced into the Forest landscape is regulated; management activities are carefully located through viewshed corridor planning; and activities are designed to assure that effects on form, line, color, texture, and scale in the Forest landscape are minimized.

The public's desire for scenic quality has increased over the years. As resource management activities have extended into previously undisturbed and undeveloped areas the public has become more vocal about protecting scenic values. Groups and individuals have actually become involved in the design, location, and scheduling of activities. The public's increasing desire for scenic quality in the Forest is partially reflected by increased demand for recreational opportunities in which scenic quality is an integral part, such as driving for pleasure, hiking, camping, and fishing.

Current Situation

The scenic resources of the Forest are described through the use of four inventories. These inventories display particular aspects of the scenic resource having significance to Forest managers, including the identification of management opportunities, visible areas, existing conditions, and resource limitations. Each of these inventories is described below.

The Forest's potential opportunity to provide scenic resource quality is determined by the Visual Resource Inventory (VRI). The VRI categorizes the Forest landscape into zones of relative scenic importance based upon attractiveness, proximity to travelways and use areas, and the concern Forest users have for scenic quality. Through this process all areas of the Forest are assigned one of five Visual Quality Objectives (VQOs), each representing relative degrees of acceptable alterations of the natural landscape. In addition, through project activities the site specific objectives of enhancement and rehabilitation may be employed to improve existing landscape conditions. A graphic illustration in Figure III-N-1 depicts VQOs on a forest landscape. Definitions and acreages of these VQOs are listed in Figure III-N-2. The spatial distribution of VQOs within the Forest is illustrated by Figure III-N-3.

The distribution of VQOs described in Figure III-N-3 are divided into viewshed and nonviewshed areas within the Forest. The Viewshed Corridor (VSC) includes the visible areas adjacent to important travelways that traverse the Forest. These areas are the most sensitive portions of the Forest in relation to the public's concern for scenic quality. The location and extent of each viewshed corridor is displayed in Figure III-N-4. Figure III-N-5 lists the Forest's most important viewsheds and displays the inventoried visual quality objective acreages fo the Forest.

Figure III-N-1. Visual Quality Objectives and Visual Condition

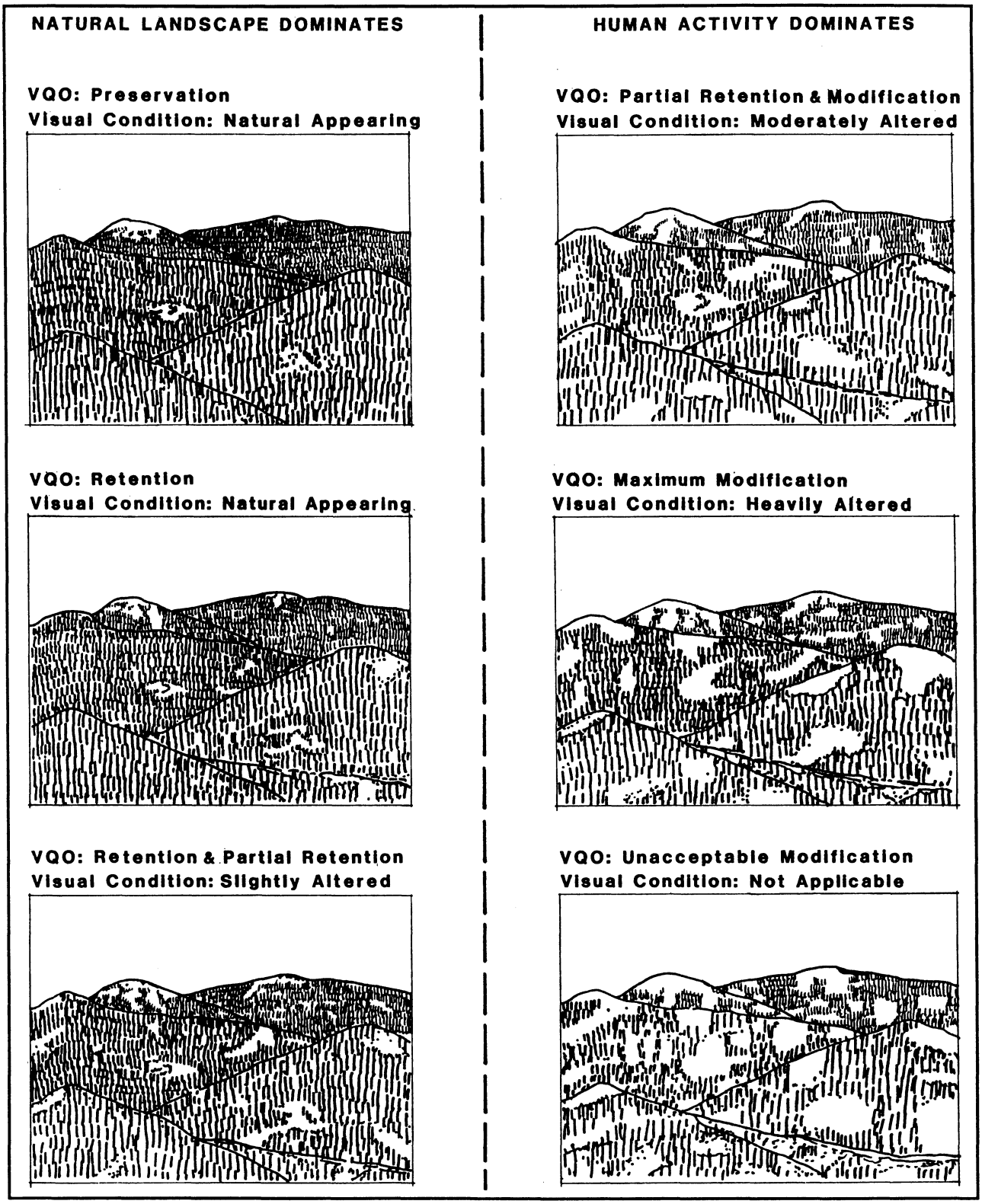
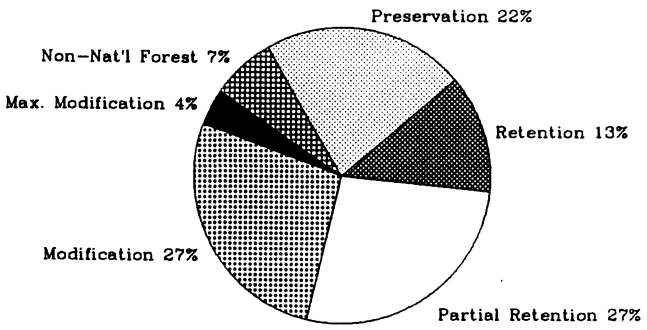


Figure III-N-2. Visual Quality Objectives Descriptions



Category	Description	Acres [1]
Preservation (P):	A VQO that provides for ecological change only.	389,486
Retention (R):	A VQO which, in general, means human activities are not evident to the casual Forest visitor.	232,262
Partial Retention (PR):	A VQO which, in general, means human activities may be evident but must remain subordinate to the characteristic landscape.	488,649
Modification (M):	A VQO meaning human activities may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture, and appear as a natural occurrence when viewed in foreground or middleground.	484,170
Maximum Modification (MM):	A VQO meaning human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.	80,841
Enchancement (E):	Enhancement is a short-term management practice aimed at increasing positive visual variety where little variety now exists. Enchancement may be achieved through alteration of existing conditions which create additional variety of forms, edges, colors, textures, patterns, or spaces.	--
Rehabilitation (REH):	Landscape rehabilitation is a short-term management practice used to restore landscapes containing undesirable visual impacts to a desired visual quality. It may not be immediately possible to achieve the prescribed visual quality objective with rehabilitation, but it should provide a more visually desirable landscape in the interim.	--
Non-National Forest Land:		123,330
TOTAL ACRES		1,798,738

[1]Forest Visual Resource Inventory (1973 as adjusted).

Figure III-N-3.

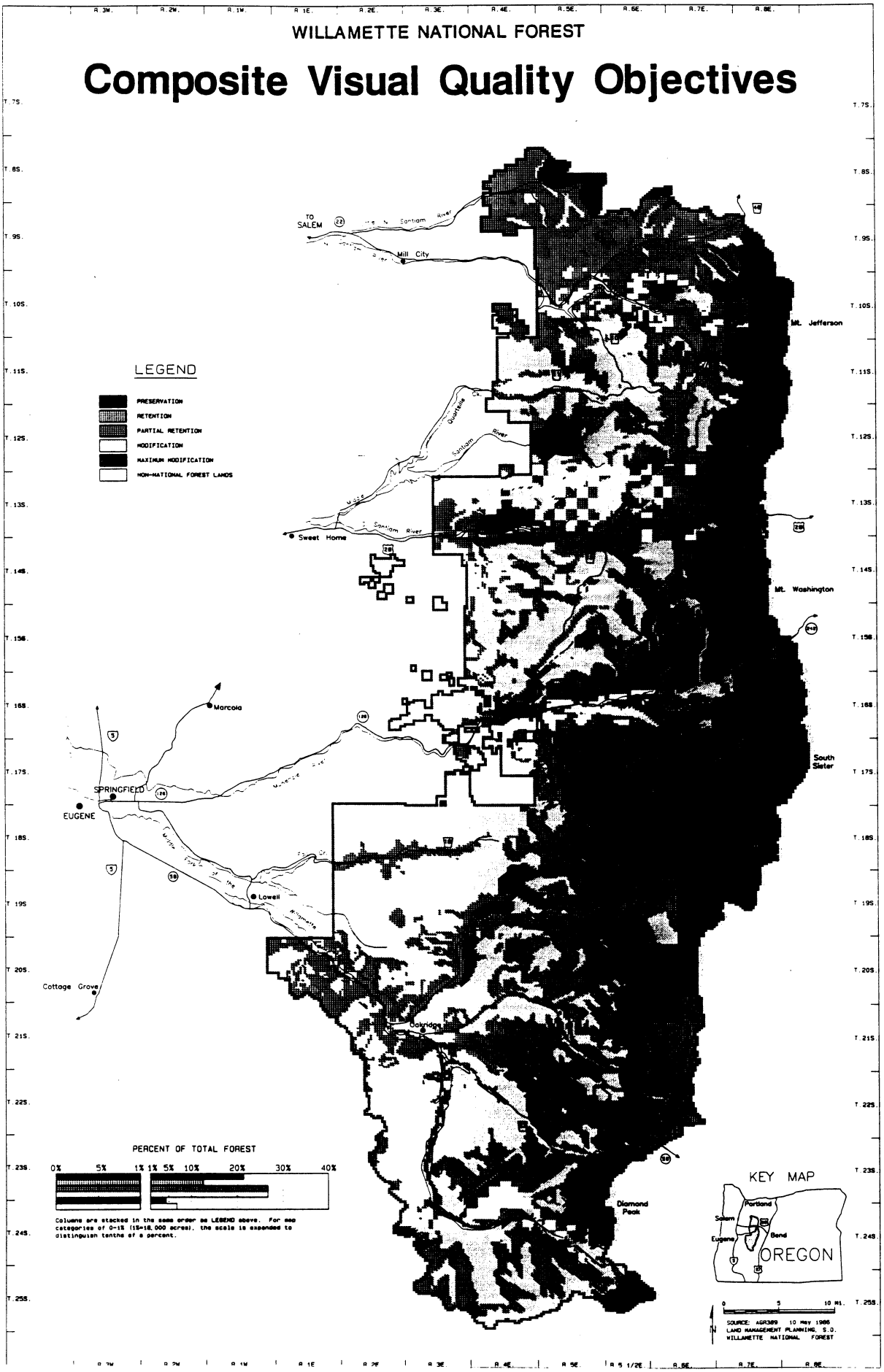


Figure III-N-4.

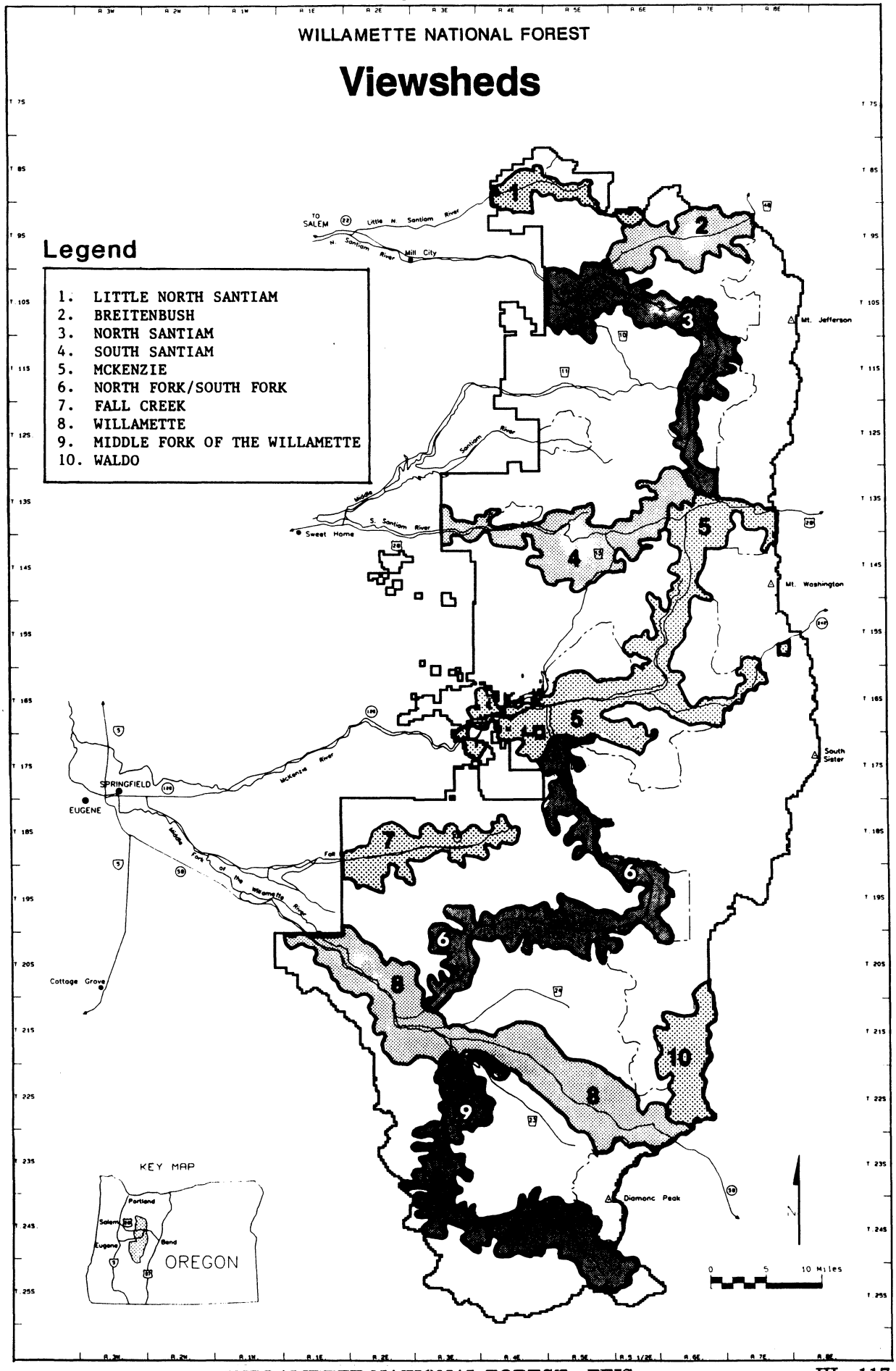


Table III-N-5. Viewshed Condition Ratings and Visual Quality Objectives

	Inventoried Visual Quality Objectives[1]							
Viewshed Corridors	**EVC[2]**	**P**	**R**	**PR**	**M**	**MM**	**NonNational Forest**	**Total Acres**
Little North Santiam	NA	--	5,674	6,058	341	--	149	12,222
Breitenbush	HA	--	15,400	15,080	1,642	--	235	32,357
North Santiam	MA	--	24,828	23,655	2,133	1,109	12,201	63,926
South Santiam	SA	43	14,078	21,031	9,343	64	8,447	53,006
McKenziey[3]	MA	384	38,159	37,413	9,087	6,570	11,518	103,131
No. Fork/So. Fork[3]	SA	--	34,149	29,094	13,971	3,200	619	81,033
Fall Creek	NA	--	2,538	6,890	21,373	--	128	30,929
Willamette	MA	--	27,452	53,261	15,486	--	6,548	102,747
Waldo	NA	469	17,747	8,447	43	--	--	26,706
Middle Fork	MA	--	128	26,428	35,557	7,145	13,992	83,250
Nonviewshed Areas	HA --	388,590	52,109	261,292	375,194	62,753	69,493	1,209,431
TOTAL ACRES	--	389,486	232,262	488,649	484,170	80,841	123,330	1,798,738

[1]See Figure III-N-2 for Visual Quality Objective descriptions and Figure III-N-1 for a graphic illustration of Existing Visual Condition (EVC) Classes.
[2]Existing Visual Condition (EVC) Classes: NA = Natural Appearing; SA = Slightly Altered; MA = Moderately Altered; and HA = Heavily Altered.
[3]Includes Designated National Scenic By Way route.

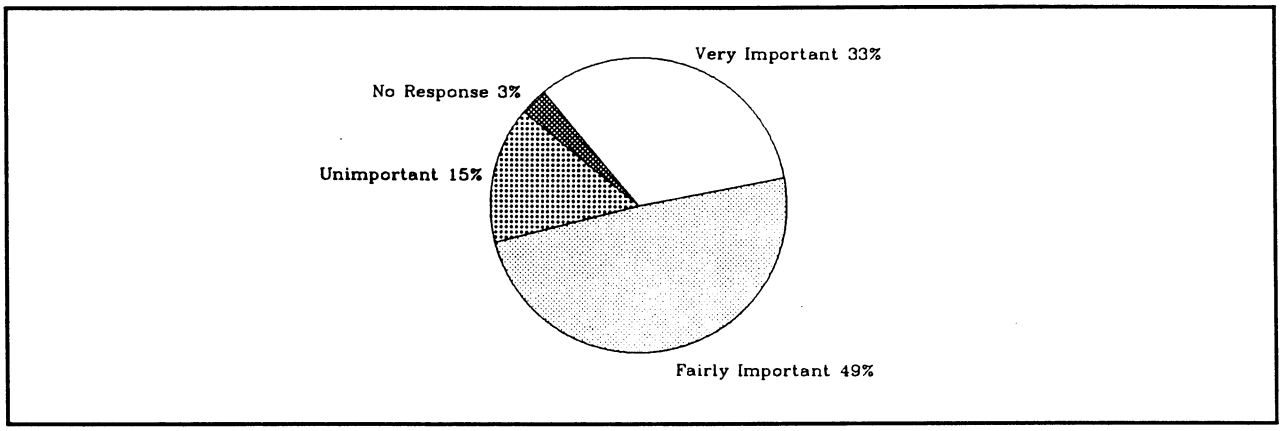
A recent evaluation of the Forest landscape was completed to determine to what extent management activities have altered the appearance of the Forest's scenic resources. This evaluation is referred to as the Existing Visual Condition (EVC) assessment and its purpose is to classify Forest lands in relation to the degree they have been altered as compared to the natural appearing landscape. The assessment stratifies the Forest landscape in to as many as four condition classes: Natural Appearing, Slightly Altered, Moderately Altered, and Heavily Altered. A graphic illustration of these EVC classes is provided in Figure III-N-1. The EVC assessment of the Forest reveals that 38% of the Forest landscape remains natural appearing and that 62% has undergone apparent management alteration. The Existing Visual Condition of the Forest's 10 Viewshed Corridors is included in Figure III-N-5. Those portions of the Forest in a natural appearing condition include Wilderness, unroaded areas, the Oregon Cascades Recreation Area, and several of the Forest's major travel corridors. The EVC assessment serves as a benchmark against which to estimate the effects of proposed management alternatives and to measure actual changes in visual conditions at some future time.

The visual resource is vulnerable to management activities and natural phenomena that alter land forms and vegetation patterns. The limitations of the visual resource to absorb these natural and management induced affects is determined through the Visual Absorption Capability (VAC) inventory. The VAC inventory provides an assessment of the relative ease or difficulty with which change may be introduced into the landscape without impairment of its value as a scenic resource. The VAC inventory reveals that 30% of the available Forest land base is rated as having a high visual absorption capacity while 15% is rated as moderate and 33% as low.

Demand for scenic quality is expressed on the basis of visual sensitivity level data and public issue response data. Tabulation of public comment data for the Forest, in 1981, as shown in Figure III-N-6,

documented that 33% of respondents feel that scenic quality is very important, 49% fairly important, and 15% unimportant. Summarization of visual sensitivity data from the VRI reveals that scenic quality is very important to Forest users particularly on lands adjacent to major federal and state highways, the most heavily used Forest roads and trails, and destination type recreation areas and sites. Approximately 48% of these areas is classified as highly sensitive; 25% is moderately sensitive, and 27% has low sensitivity. The publics concern for scenic quality was expressed through more than 4,000 specific comments on the DEIS and Draft Forest Plan. Of these comments, most (85%) favored protection and maintenance of scenic resource quality with a major emphasis on Viewshed Corridors of State Highways and major Forest roads. The remaining 15% of the public comment expressed concerns that too much area is allocated for scenic resource protection and that quality objectives and management standards are too restrictive.

Figure III-N-6. Public Input on Scenery



The Forest coordinates with other agencies (federal, state, and local) to ensure that visual resource quality is maintained along state and federal highways, around reservoirs, in and around utility line clearings and at electronics sites. In areas of the Forest where private land holdings are heaviest (i.e., along portions of State Highway 20, 22, 126, and 58 and along Forest Road 21) the Forest Service has no control over these lands nor the effects that their management may have on scenic quality. However, every opportunity to coordinate management activities with private land owners is persued to maintain or improve the scenic resource quality in these corridors.

The operation and maintenance plans of the Army Corps of Engineers, Eugene Water and Electric Board, Bonneville Power Administration, and the Oregon Department of Fish and Wildlife are reviewed to identify the potential conflict of activities and to ensure coordination with Forest Service Visual Resource Management objectives.

Additionally, the Forest will coordinate with state and county law enforcement agencies for the location, operation, and maintenance of electronic sites; state and county highway departments for the operation and maintenance of roads and roadside zones; Bureau of Land Management (BLM) for their role in managing subsurface minerals; and the Oregon Department of Aeronautics for management of two small air strips within the Forest.

Since release of the DEIS, the Forest Service has sought to draw attention to and encourage use of the nations scenic resources through establishment of the Scenic ByWays Program. National Forest

Scenic ByWays are being established to maintain, enhance, and interpret the extraordinary cultural, geologic, biological and historical features along selected Forest travel routes. Nation-wide Scenic ByWays are being designated for the natural beauty and scenic diversity through which they pass and for their potential to provide enjoyable, memorable experiences for those who drive for pleasure or use the open road for vacation activities.

Two Scenic Byways have been designated on the Forest and more may be nominated for Scenic ByWay status in the future. The Robert Aufderheide Memorial Drive parallels for 70 miles the South Fork of the McKenzie River and the North Fork of the Middle Fork of the Willamette River on Forest Road 19. The McKenzie Pass - Santiam Pass Scenic ByWay loop follows portions of State Highway 20, 242, and 126 for 82 miles through the volcanic landscape of the recent Cascades with spectacular views of mountian peaks and alpine lakes. Scenic ByWay designation of these two travel routes does not preclude other activities such as creating new views or vistas; interpretive programs, wildlife management programs, meadow habitat improvements; or timber harvesting.

Future Trends

The condition of the scenic resource is expected to change as management activities are implemented to fulfill Forest Plan objectives. Human-caused changes in the condition of the scenic resource during the next decade will primarily result from two factors: the rate at which timber harvest and road building occur; and the rate at which harvested and otherwise disturbed areas become revegetated.

Timber resource management activities may change the character of the scenic resource by altering the landscape's vegetative cover through silvicultural treatments. Intensive treatments such as clearcutting present new patterns of openings in the Forest canopy. Depending on how these openings are designed, they have the potential to contrast significantly with the adjacent area. This potential contrast is greatest in areas where the Forest canopy is homogeneous. Planned alterations, in areas with little natural variety, which incorporate those attributes of the characteristic landscape, however subtle, propose to assure the scenic quality of an area. It is anticipated that changes will become more apparent in areas that are at this time natural appearing.

Road construction can also change the scenic resource by creating unnatural appearing cut or fill slopes. This may be especially evident in steep topography where cut and fill slopes appear as strong horizontal lines. This type of change is generally long lasting and apparent even when viewed as background (3-5 miles viewing distance).

Interest in and concern for scenic quality is increasing with the demand for recreational opportunities. As population increases within the Forest's area of influence greater numbers of Forest users will expect attractive and pleasing environments for many of their recreational activities. The quality of view from recreation sites, scenic travelways, and prominent view points will become increasingly important.

Future demand for scenic quality is expected to parallel demand for both developed and dispersed recreational activities for which scenic quality is an integral part. Forest users engaged in recreation pursuits seem to prefer settings that are physically attractive. Many of these users have formed expectations about how the Forest should look and express concern when their observations are different from their expectations.

Recreationists generally are attracted to scenic features and, in turn, tend to generate interest in protection of these features to maintain the integrity of the physical settings for activities in which

they participate. The quality of the experience derived from these settings is becoming increasingly important to the tourism industry as it becomes more dependent on the scenic quality of the forest.

Management to achieve scenic resource objectives may increase the cost of operations due primarily to the techniques employed during project design and actual implementation. Such techniques may include use of unevenaged silvicultural systems, road location, road closures, use of vegetative screens, seeding cut and fill slopes, and use of color applications on rock walls or structures to reduce contrast between management activities or facilities and the surrounding landscape.

WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act of 1968 (Public Law 90-542 as amended) established a method for providing federal protection for certain of our remaining free-flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides. Section 4(a) of the Act mandates that all rivers designated as potential additions to the system be studied as to their suitability for inclusion in the system. Rivers can be identified for study for potential inclusion in the System by several means:

1. Federal statute that mandates federal agencies to study a river pursuant to section 5(a) of the Act.

2. Identification for study by the Secretary of Agriculture or the Secretary of the Interior pursuant to section 5(d) of the Act.

3. The Nationwide River Inventory (NRI) developed by the National Park Service.

4. The land management planning process.

In accord with section 4(a) of the Wild and Scenic Rivers Act, the Departments of Agriculture and Interior initiated studies of several rivers which the Act authorized for study as potential additions to the National Wild and Scenic Rivers System. In order to facilitate the study process, it became necessary for the two agencies to agree to a uniform evaluation and management approach. Therefore, the *Guidelines for Evaluating Wild, Scenic and Recreational River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System Under Section 2, Public Law 90-542* was prepared and promulgated in February 1970. The guidelines not only provide guidance for the congressionally mandated studies, but are also useful for evaluations conducted by land management and water resource development agencies under section 5(d) and for States applying for inclusion of State-designated rivers in the national system. In addcord with these guidelines the river planning and assessment process follows a three-step procedure that includes: determination of eligibility; potential classification; and determination of suitability.

Eligibility of a river is determined by applying specific criteria ("free-flowing" conditions and "outstandingly remarkable values") from the Act and from the USDA-USDI Guidelines. For a river to be eligible for designation to the National System it must be "free-flowing" as defined by the Act and posses one or more "outstandingly remarkable values" with in the river area, such as scenic, recreational, geological, fish and wildlife, historical, cultural or other values, including ecological values. Application of these criteria is based on the professional judgement of an interdisciplinary study team and their collective knowledge of individual rivers or river segements.

When a river or river segment is found to be eligible, it is given a potential classification of Wild, Scenic, or Recreation. The classification of a river is based on the conditions of the river and that of adjacent lands. Figure III-O-1 provides a brief description of each river class used in this step of the process.

Table III-O-1. Wild and Scenic River Class Descriptions

Classification	Description
Wild	Free of impoundments Inaccessible except by trail or water surface Watershed or shorelines primitive Waters unpolluted
Scenic	Free of impoundments Shorelines largely primitive Accessible in places by roads Timber harvest may be practiced within the 1/4-mile corridor
Recreation	Readily accessible by road or railroad Some development along shorelines Some impoundment or diversion in the past Segments may be in or near urban areas Timber harvest may be practiced within 1/4-mile corridor

[1]See also Figure III-O-4 for location and extent of designated rivers.

Determination of suitability is the final step in the river assessment process. This step provides the basis for the decision to recommend designation or nondesignation of eligible rivers to the United States Congress . The determination of suitability considers: characteristics which do or do not make an area a worthy addition to the National System; current status of land ownership, including amount and type of private land uses; potential land and water uses that would be enhanced, curtailed or foreclosed; public, State, and local governmental interests; estimated costs of acquiring necessary lands and interests, and for administration if added to the System; and other issues and concerns identified during the river planning process.

In Oregon, rivers can be designated as part of the National Wild and Scenic Rivers System through an Act of Congress or an Act of the Oregon Legislature and subsequent applications by the Governor of Oregon to the Secretary of Interior. In addition, rivers within the Forest may be designated as State Scenic Waterways. The Oregon Scenic Waterways program, established in 1970, is administered under the authority of the Oregon Transportation Commission through the State Parks and Recreation Division (ORS 390.805-ORS 390.925).

Historic Trends

Cultural History

As long ago as 10,000 years, rivers now under jurisdiction of the Forest had been utilized as travel routes and sources of subsistence materials by aboriginal peoples. Prehistoric use of river corridors has been confirmed by archaeological survey along the Blue River, Breitenbush River, South Fork McKenzie River, South Breitenbush River, McKenzie River, Middle Santiam River, Quartzville Creek, North Fork of Middle Fork Willamette River, Middle Fork Willamette River, and the South Santiam River.

In the late 1700s-early 1800s, Euro-American uses of these rivers consisted of trapping, hunting, and fishing. The Middle Fork Willamette country was first explored by Hudson's Bay Company fur traders in the 1820s. Prospecting and mining were important especially along the Little North Santiam River, South Fork McKenzie River, and Quartzville Creek. Later, in the mid-1800s as the Willamette Valley began to be settled by migrants from the east the river corridors were sites of homesteads and livestock

grazing particularly on the South Santiam River, Middle Fork Willamette River, and South Fork McKenzie River. The first recorded passage down the McKenzie and the Middle Fork Willamette Rivers was in 1853. The South Santiam River corridor was explored by early entrepreneurs for location of the Cascade Mountains and Willamette Valley Wagon Road, an east-west passage across the western Cascades. Another historic route, the Oregon Central Military Wagon Road was located along the Middle Fork Willamette River in the 1860s.

By the turn of the century, Euro-American settlers had established lodges and hotels near the hot springs of the Breitenbush River and McKenzie Rivers, and way stations along riverside transportation corridors at Rigdon Meadows (Middle Fork
Willamette River) and Long Ranch (South Santiam River) providing food and shelter for pioneer travellers. Evidence of the 1930s Depression Era can be seen in Civilian Conservation Corps construction of organization camps and trail shelters particularly along the South Santiam, Breitenbush, McKenzie, and North Fork of Middle Fork Willamette Rivers.

Hydroelectric power has been developed within several of the river corridors ranging from small hydroelectric plants on the South Santiam River to Cougar Dam and its much larger power generation facilities along the South Fork McKenzie River. Extensive studies of flood control facility feasibilities were conducted by the Army Corps of Engineers in the 1950s with resultant construction of many of the dams in the 1960s. Dams or reservoirs extant within Forest boundaries are: Blue River, Hills Creek, Lookout Point, Detroit, Trailbridge, Carmen, and Smith.

Planning History

The 1977 Forest Environmental Impact Statement documents that Wild and Scenic River Act criteria were used to evaluate Forest streams in 1970. At that time no streams on the Forest were selected by either the Secretary of Agriculture or the Secretary of Interior for inclusion in the National Wild and Scenic Rivers System. The status of rivers on the Forest changed in the early 1980s when the Little North Fork of the Santiam and the North Fork of the Middle Fork Willamette River, including Waldo Lake were designated by the Oregon State Legislature as State Scenic Waterways in 1983 and 1985 respectively.

The Forest planning process addressed the Wild and Scenic River issue during development of the 1987 DEIS/FP. Planning direction for WSR evaluation at that time required National Forests to focus on rivers identified in the Nationwide Rivers Inventory (NRI). The NRI included segments of the McKenzie River and the Breitenbush River within the Forest. During the process of determining eligibility for both rivers the Breitenbush was determined ineligible for further consideration as a potential WSR. It was subsequently removed from the NRI by the National Park Service (USDI Memo: RES 20-1(PNR-RP) November 16, 1982). The McKenzie River was found to be eligible and met the criteria for classification as a Recreation River. As required by planning regulations, the McKenzie River was recommended for WSR designation in at least one DEIS alternative: Alternative C. Subsequently, the McKenzie River was determined not suitable for inclusion in the National Wild and Scenic River System, but was proposed for management as a Special Interest Area in the Draft Forest Plan.

Following release of the DEIS/FP significant feedback on rivers and river management issues was recieved from several public interest groups. The review comments of these groups focused attention on how rivers were addressed in the planning documents. Review comments included discussions regarding protection of specific rivers, WSR designation, management activities, resource effects, and the planning process itself. The issue of river management intensified during the document review period, and although the subsequent passage of both federal and State river legislation was significatly

influenced by these interest groups, river designation and management of river resources remains a significat issue.

In the Oregon Omnibus Wild and Scenic Rivers Act of 1988 two rivers were designated as included in the National Wild and Scenic Rivers System and two rivers were desinated as Wild and Scenic Study Rivers. Also two additional rivers were added to the State Scenic Waterways System through a State ballot measure on November 8, 1988. Those rivers designated as included within the National Wild and Scenic River System, federally designated as Study Rivers, or designated as State Scenic Waterways are discussed and their designation status summerized below.

In response to public comment and intensified concern regarding the management of Forest rivers, a process was initiated in December of 1988 to determine Wild and Scenic River eligibility of those rivers identified through public comment to the Draft Environmental Impact Statement and Draft Forest Plan. In accord with the laws and regulations described above and through application of the river assessment process described in the Land and Resource Management Planning Handbook (FSH 1909.12 Chapter 8 - Wild and Scenic Rivers Evaluation) and Forest Service Manual 1924, the Forest identified segments of several rivers within the Forest's boundaries as being eligible for inclusion in the National Wild and Scenic Rivers System. The Forest's eligibility assessment of these rivers was completed by an Interdisciplinary Team (IDT) supported by representatives from each Ranger District. The results of the eligibility assessment and determination of potential river classification as either a Wild, Scenic, or Recreation River segment are sumerized later in this section.

Current Situation

Designation Status of Forest Rivers

Through both federal and State legislation in 1988 the Forest gained two federally-designated Wild and Scenic Rivers, two federally-designated Wild and Scenic Study Rivers, and two designated additions to the State Scenic Waterways System.

The Oregon Omnibus Wild and Scenic Rivers Act of 1988 designated the McKenzie River, from Clear Lake to Scott Creek, and the North Fork of the Middle Fork Willamette River, from Waldo Lake to near West Fir, Oregon, as National Wild and Scenic Rivers. The same Act designated Blue River from its headwaters to Blue River Reservoir, and the South Fork McKenzie River from its headwaters to Cougar Reservoir and from Cougar Dam to the McKenzie River as Wild and Scenic Study Rivers.

Additions to Oregon's State Scenic Waterways System through passage of a state ballot measure on November 8, 1988 include: the McKenzie River, from Clear Lake to Paradise Campground; and the South Fork McKenzie River, from its headwaters to Cougar Reservoir and from Cougar Dam to the McKenzie River. In addition the Little North Fork of the Santiam River, from its confluence with Opal Creek and Battle Axe Creek to the Forest boundary, and the North Fork of the Middle Fork of the Willamette River, from its headwaters, including Waldo Lake, to the Middle Fork Willamette River are also included in the State Scenic Waterways System. The current designation status of Forest rivers is summerized in Figure III-O-2. A full description of these rivers is included in Appendix E of the FEIS.

Table III-O-2. Designation Status of Forest Rivers [1]

River Name	National WSR	State Scenic Waterway	National WSR Study River
Little North Santiam		X	
McKenzie	X	X	
Blue River			X
South Fork McKenzie		X	
NF MF Willamette	X	X	

[1]See also Figure III-O-4 for location and extent of designated rivers.

The free-flowing conditions and outstandinly remarkable values of designated Wild and Scenic Rivers are protected and managed in accord with: the USDI-USDA Interagency Guidelines (47 Fed. Reg. 39454); the standards and guidelines for each river class as noted in the Land and Resource Management Planning Handbook (FSH 1909.12 Chapter 8 - Wild and Scenic Rivers Evaluation); and the management direction outlined in the Forest-wide and Management Area Standards and Guidelines in Chapter IV of the Land Management Plan. These management standards and guidelines apply to a designated Wild and Scenic River until a River Management Plan is approved and to a designated Study River until it has been determined not suitable for inclusion into the National System or until action is taken by the U.S. Congress. Wild and Scenic River Management Plans for the McKenzie River and the North Fork of Middle Fork Willamette River are currently being developed and are expected to be completed during 1991.

In general interim management of designated or study river corridors should, to the extent the Forest Service is authorized under the law, provide for: control of stream impoundments and diversions, and maintenance of free-flowing characteristics in an unmodified condition; protection and to the extent practicable enhancement of outstandingly remarkable values of identified rivers; and the maintenance of a rivers eligibility for inclusion in the National System at the highest river classification for which it qualifies.

The Oregon Scenic Waterways Act generally requires notification of proposed changes of land use within 1/4 mile on each side of the designated waterway to be evaluated for their potential to impair the natural scene. The Act also requires the Commission to cooperate with local, state, and federal agencies to ensure their compliance with the requirements of the Act and to study additional rivers for possible inclusion in the State Scenic Waterways System.

Eligible and Ineligible Rivers

As described above, the Forest initiated an assessment process to determine eligibility and classification of those rivers identified through public comment to the DEIS for their potential inclusion in the National Wild and Scenic Rivers System. The results of this process, based on application of specific criteria for "free-flowing" conditions and "outstandingly remarkable values" from the Act and and from the USDA-USDI Guidelines are provided below.

Included in summary form in Figure III-O-3 are the findings of the eligibility and classification assessment process and related information. "Outstandingly remarkable values" that are listed for each river are those that were considered (on a scale of 1-10) to be 7 or higher in the following categories: scenic, recreation, geologic, fish, wildlife, historical/cultural, ecological/biological. In addition river miles and approximate corridor acreages are provided for each river segment. Complete descriptions of each

river evaluated for its elegibility for potential inclusion in the National Wild and Scenic Rivers System are located in Appendix E of the FEIS. The location and extent of each river segment evaluated is displayed in Figure III-O-4.

Current planning direction requires protection of free-flowing conditions and "outstandingly remarkable values" of eligible river segments at the highest river classification for wihich they qualify. Protection is extended until a river segment is found not suitable for inclusion in the National System or until action is taken by the U.S. Congress. Land and Resource Management Planning direction also requires that suitability determinations of all eligible rivers be completed with in five years. This process will determine whether a river should or should not be recommended to Congress for inclusion in the National Wild and Scenic River System. River segments determined ineligible for inclusion in the National System will continue to be managed for a wide range of multiple-uses consistent with Current Forest Plan direction.

Generally speaking, the designated and eligible rivers under Forest administration can be described as having outstanding scenery, rich native fisheries and wildlife habitats, unique historic and prehistoric remnants throughout the river corridors, and diverse recreation opportunities ranging from whitewater kayaking to hiking on tranquil riverside trails.

Since the mid-20th century, the river corridors in the Forest have been the focus of tremendous growth in the numbers of recreational users with the majority of visitors utilizing the outstanding recreation potential of those most accessable. Many Forest campgrounds within these river corridors offer developed water-oriented facilities to visitors, and dispersed camping spots are located adjacent to virtually every designated or potential Wild and Scenic River. Recreation outfitters specializing in guiding whitewater or fishing activities depend on seasonal tourism and the continued growth of that industry as do commercial enterprises and service sector businesses.

Figure III-O-3. Eligibility and Classification Status of Forest Rivers

River	Segment Description	River Class	Outstanding Values	Miles	Acres [1]
Little North Santiam River	Battle Axe Creek to Forest boundary	Scenic	Scenic	7.8	2,626
Battle Axe Creek	Headwaters to confluence with Opal Creek	Not eligible	--	5.0	1,727
Opal Creek	Opal Lake to confluence with Battle Axe Creek	Not eligible	--	4.0	1,493
North Fork Breitenbush River	Confluence with NF of NF and SF of NF to SF Breitenbush	Not eligible	--	7.0	1,941
	Headwaters of SF of NF to confluence with NF of NF Breitenbush	Not eligible	--	3.5	597
South Fork Breitenbush River	Russell Lake to Wilderness boundary	Wild	Scenic, Wildlife	4.0	1,749
	Wilderness boundary to Breitenbush River	Scenic	Scenic, Wildlife	6.5	1,834
Breitenbush River	North Fork Breitenbush River to Detroit Reservoir	Recreation	Recreation	9.5	3,040
North Santiam River	Headwaters to Wilderness boundary	Wild	Wildlife	3.8	1,450
	Wilderness boundary to Highway 22	Scenic	Scenic	4.2	1,088
	Highway 22 to Rainbow Creek	Recreation	Ecology	19.5	6,912
	Rainbow Creek to Detroit Reservoir	Not eligible	--	3.5	1,130
Quartzville Creek	Headwaters to unnamed creek west of Bruler Creek	Recreation	Scenic	2.30	875
	Unnamed creek west of Brule Creek to Forest boundary	Recreation	Scenic	10.0	2,944

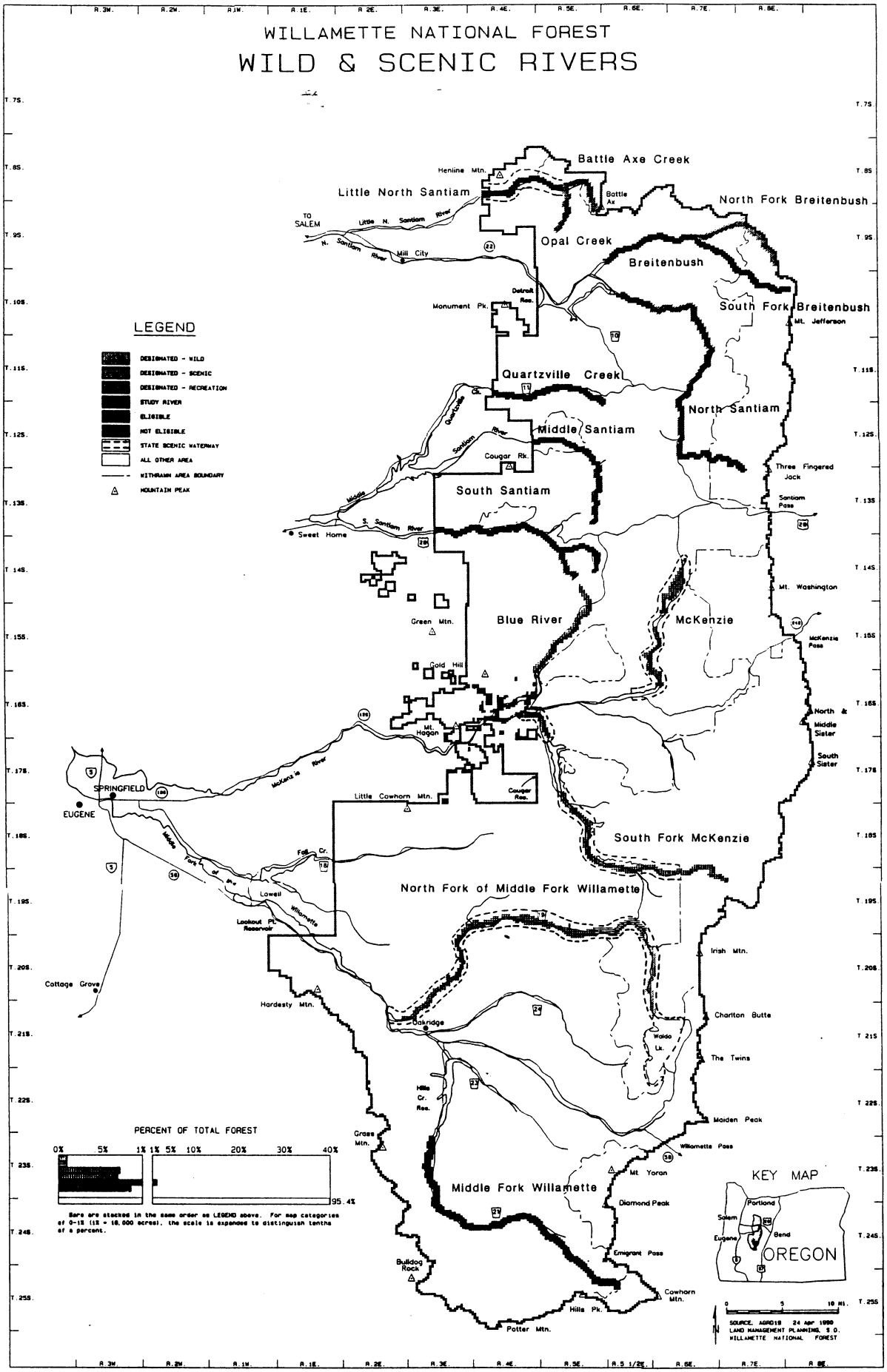
[1] Acreages are based on a 1/2-mile-wide corridor as represented in the Forest Grid Mapping System database.

Figure III-O-3 Cont. Eligibility and Classification Status of Forest Rivers

River	Segment Description	River Class	Outstanding Values	Miles	Acres [1]
Middle Santiam River	Headwaters to west boundary Section 31	Not eligible		6.0	2,090
	West boundary of Section 36 to Wilderness boundary	Scenic	Scenic	2.0	853
	Wilderness boundary to Forest boundary	Wild	Scenic, Ecological/ biological	6.0	1,493
South Santiam River	Headwaters of Sevenmile Creek to Squaw Creek	Wild	Scenic	4.0	1,706
	Headwaters of Squaw Creek to Sevenmile Creek	Not eligible	--	3.0	1,024
	Sevenmile Creek to Forest boundary	Recreation	Scenic, Wildlife, Historic	10.8	4,287
Middle Fork Willamette River	Lower Timpanogas Lake to Echo Creek	Scenic	Scenic, Historical/ Cultural, Ecological/Biological	16.0	5,674
	Echo Creek to Hills Creek Reservoir	Recreation	Recreation, Wildlife, Historical/ Cultural	14.0	5,247
TOTAL	Rivers Evaluated	--	--	152.0	51,780
	Rivers Eligible	--	--	120.4	41,760

[1] Acreages are based on a 1/2-mile-wide corridor as represented in the Forest Grid Mapping System database.

Figure III-O-4.



Future Trends

Demand for Wild and Scenic River designation is primarily expressed through public comment and response to agency proposals. The degree to which this comment and response favors designation is an indication of demand for a wide range of uses, activities, and resource qualities associated with management of river corridors. One of the primary attractions of designated and potential Wild and Scenic River corridors is the vast opportunities they provide for recreation activities.

Although recreation demand is closely related to present population numbers and projected growth of the local areas, the act of river designation would likely result in increased levels of recreation use in the designated and potential Wild and Scenic River corridors. Principal increases in use, in the event of designation, would probably be in dispersed recreation activities. National designation of the rivers as Wild, Scenic, or Recreation has the potential to increase future tourism development in local areas, enhancing the Forest and the region as a recreation destination as well as providing economic benefits to local communities.

In the event of designation, most Forest management principles will apply only to federal lands within the designated or eligible river area. In the case of both federal and private ownership of river corridor lands, Forest management standards will apply only to the extent required by other laws such as local zoning and air and water pollution regulations.

Management of some river corridors without Wild and Scenic River designation could pose a threat to the quality or conditions of those resource values that permit river segments to be eligible for designation status (i.e., water quality, fisheries, scenic quality, recreation opportunities, and cultural/historic preservation). However, threats to Wild and Scenic River resource values will be relative to the particular Management Areas applied to individual river corridors. Most river corridors identified in Figure III-O-4 are allocated to Management Area prescriptions that in many ways provide conditions equal to those expected within some Wild and Scenic River classes.

Specific activities that could alter river values and thus affect river eligibility or classification include timber harvest, road and bridge construction, geothermal development, expansion of hydroelectric generating facilities, and some forms of development and management of private lands within river corridors. The affects of these activities could result in environmental changes in the river corridors that limit any future consideration of the rivers for inclusion into the National Wild and Scenic River System.

Changes in the natural appearance of the landscape because of timber harvest and or road development could alter the types of recreation experiences people have in these river corridors. Road development can have an effect on the resources of the river corridors as well as the users' sense of loss of remoteness through increased accessibility.

The amount of visible management in the river corridors would vary by the type of Management Area applied. For example, the amount of harvest activity in special categories, such as Recreation River or Scenic Resource areas is moderated by extending the management rotation period from 40 to 120 years longer than that used in Geneeral Forest areas. In addition harvest unit design characteristics are modified and a wide range of silvilcultural systems are employed to minimize affects and protect river values.

Dams and impoundments within river corridors would alter their free-flowing conditions. Altering these conditions would change the eligibility of the river for inclusion in the Wild and Scenic Rivers

System. If a river were to be included in the National Wild and Scenic Rivers System, dam building and development of the river's hydroelectric potential would not be permitted.

WILDERNESS

The Forest Service began administering some of the National Forest System lands to preserve their primitive character as early as 1930. Congress formalized the designation of Wilderness in 1964 with the passage of the Wilderness Act. It contains the following definition:

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is . . . recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean . . . an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

The purpose of Wilderness is . . . to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas . . . leaving no lands designated for preservation in their natural condition . . . (The Wilderness Act; Public Law 88-577 September 3, 1964).

To further this purpose and the intent of Congress, through the Wilderness Act, the National Wilderness Preservation System promotes, perpetuates, and preserves the wilderness character of the lands, protects watersheds and wildlife habitat, preserves scenic and historic resources, and promotes scientific research, primitive recreation, solitude, physical and mental challenge, and inspiration for the benefit of all Americans, to a greater extent than is possible in the absence of Wilderness designation.

The philosophical foundation on which National Forest Wilderness management rests is grounded in values that include aesthetics, water and air quality, wildlife and wildlife habitats, and vegetative diversity, as well as recreation. Wilderness lands within the National Forest have value precisely because they are not required to include a human component; rather, they will be sustained only if human impacts are minimal. This does not preclude public use, but actually enhances the Wilderness experience for those who venture into such an environment.

Wildernesses offer recreationists unique opportunities for physical challenge and solitude in natural settings where evidence of human activities is negligible. In addition to special recreation experiences, Wildernesses provide diverse plant and wildlife habitats as well as summer range for big game such as deer and elk. They often serve as important watersheds, collecting and channeling large quantities of water for downstream uses throughout the year.

Historic Trends

Several trends relating to Wilderness are evident, including establishment of areas, type and amount of use, and management influences.

The preservation of Wilderness has evolved in two ways since the early 1930s. A notable change is the methods of classifying areas to be preserved. Areas were first classified as primitive areas, wild areas,

and then Wilderness using agency administrative authorities and, then, after 1964 as Wilderness by Acts of Congress. This latter method is now the only way in which lands are established as Wilderness.

In addition to the change from administrative to congressional designation of areas, the amount of area preserved as Wilderness has increased. Figure III-P-1 illustrates the reclassification trend of areas, and the increases in the amount of land preserved as Wilderness on the Forest since 1930.

Table III-P-1. Wilderness Classification Trends

Classification Type	1930	1933	1937	1938	1956	1957	1964	1968	1978	1984
Primitive Area	32,420	57,520	184,820	240,820	240,820	57,520	57,520			
Wild Area					38,030	54,230				
Wilderness [1]						189,833				
Wilderness [2]							191,063	254,744	301,933	380,805
CUMULATIVE TOTAL	32,420	57,520	184,820	240,820	278,850	301,583	248,583	254,744	301,933	380,805

[1] Administratively designated.
[2] Congressionally designated.

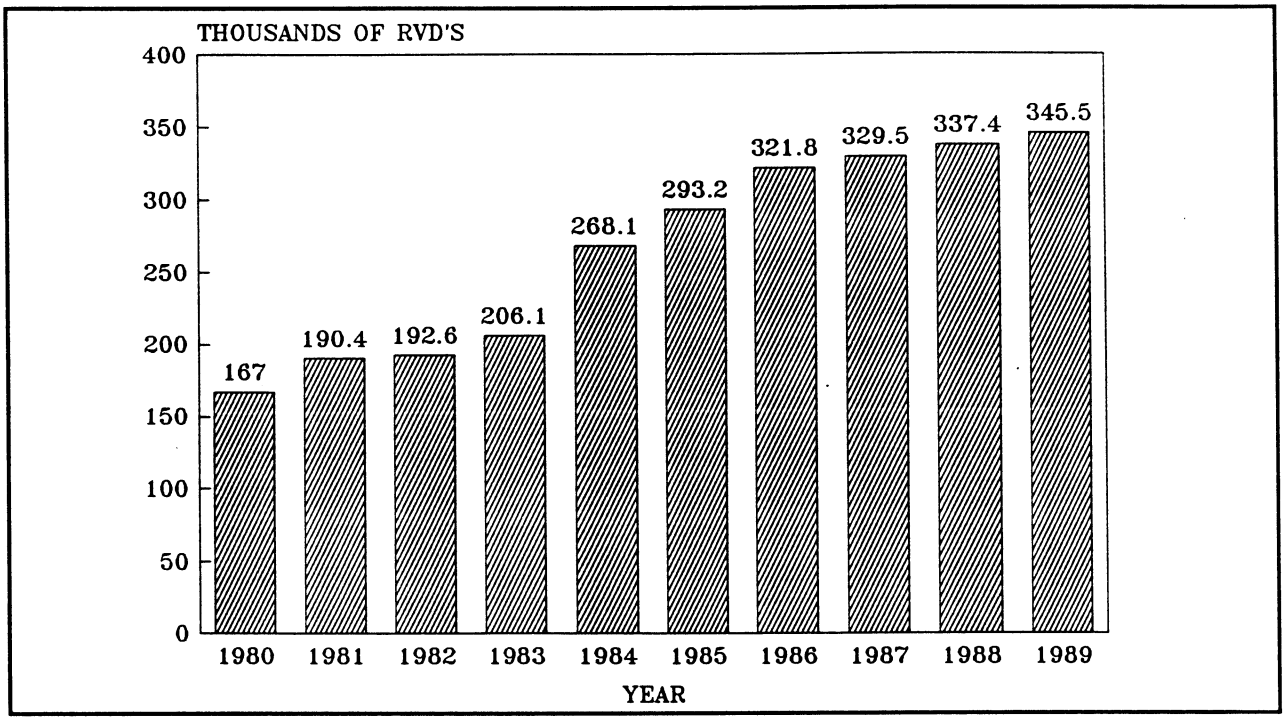
Most of the trails in the Forest Wilderness were originally built for purposes other than recreation. Excluding those trails most recently constructed, most trails were developed for administrative purposes requiring direct access to destinations such as guard stations and fire lookout locations. Little attempt was made, therefore, to design trails with scenic vistas or gentle grades. Since expediency was the rule in the early days of Forest trail construction, some trails may have excessive grades, poor drainage and hazardous stream crossings for packstock and hikers.

Wilderness use, since the mid 1940s, has increased dramatically, and the range of activities that Wilderness users engage in has broadened considerably. Due to significant increases in population, leisure time, and prosperity, National Forest Wilderness visitation since the mid 1940s has increased nearly three times over the use level of the mid 1930s. Recreation activity participation, following World War II, broadened from traditional forms of use such as hunting, fishing, hiking, and camping to include nature study, photography, mountain climbing, snow camping, skiing, and commercially guided pack and saddle trips.

The primary source of visitor use data in wilderness is the Forest's Recreation Information Management (RIM) system. All use and capacity data use here are expressed as Recreation Visitor Days (RVDs). One recreation visitor day equates to twelve hours of use. Figure III-P-2 illustrates Wilderness use in the Forest for the period 1980 to 1989.

Recent trends in total Wilderness use as reported in RIM have shown a steady increase between 1980 and 1989. Some of this increase, particularly since 1984, is a result of the transfer of reported use from dispersed recreation areas, as more Wilderness is designated. The addition of several new Wildernesses in 1984 means that even more use will be attributed to Wilderness than in the past.

Figure III-P-2. Wilderness Use



During the 1980-89 period, participation in most recreation activities increased at varying rates with some noticeable peaks, valleys, and plateaus in the trend lines. It is evident from the data that recreation use is affected by such variables as weather, travel costs, general economic conditions as well as emerging forms of recreation activities. Total Wilderness use dropped significantly after 1974, following the first "energy crisis" and has only recovered to pre-1974 levels in recent years.

Most recently, the perception of the value of Wilderness lands has expanded from an essentially recreation focus to one that includes consideration for the contributions that Wilderness areas can make to fisheries, water quality, wildlife habitat and healthy wildlife populations, ecosystem research, plant and animal diversity, and commercial use. For example, fisheries experts have recognized that high water quality within Forest Wilderness watersheds is a primary determinant of the viability of downstream fisheries. Most of the lakes within Forest boundaries are in the High Cascades Wildernesses, 74% of which are fish-bearing. Heavy snow pack collects on the permeable lava beds at high elevations supplying critical ground water re-charge. Wilderness lands are also refugia for many plant and animal species, such as arthropods, reptiles, amphibians, and soil organisms, certainly humble but necessary components of the forest ecosystem.

Although the evidence of past fires is not always apparent, especially in the western Cascades, most biological communities have evolved with the presence of fire. Fire suppression efforts during the past 40 to 50 years have generally suppressed fires in Wilderness at a smaller size than free-burning natural fires, modifying the role of fire in Wilderness ecosystems.

The public in its response to the 1987 Draft Environmental Impact Statement was concerned mainly with issues of management planning, development of standards and guidelines, and long term protection; size of Wilderness areas; regulation of user group size and length of stay, including commercial operations;

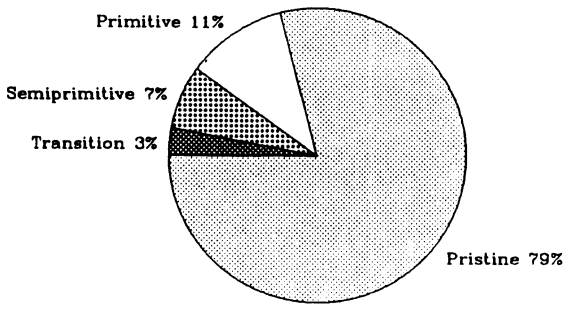
concern for animals in the Wilderness such as dogs, packstock, and llamas and their effects on the environment and wildlife; consideration for Wilderness values other than recreation; and suppression of natural fires.

Current Condition

The Forest's existing supply of Wilderness opportunities and experiences is derived from eight established areas. Management of five Wildernesses is shared with two other Forests--the Deschutes and Mt. Hood National Forests. The Forest presently contains 380,805 acres of designated Wilderness. This acreage is approximately 21% of the Forest and contains 642 miles of Wilderness trails. Wilderness trails comprise 47% of the Forest's total trail mileage.

The Forest has utilized the Wilderness Resource Spectrum (WRS) inventory process as a method to identify WRS classes within each Wilderness and continues to use this system as a framework for Wilderness management. Figure III-P-3 provides a description of each of the WRS classes.

Figure III-P-3. Wilderness Resource Spectrum Class Descriptions [1]



Classification Type	Descriptions
Pristine	This class is characterized by an extensive unmodified natural environment. Natural processes and conditions have not and will not be measurably affected by the actions of users. The area is managed to be as free as possible from the influences of human activity. People are only brief visitors. Essentially no facilities are required to protect the Wilderness resource. Terrain and vegetation allow extensive and challenging cross-country travel. This class provides the most outstanding opportunity for isolation and solitude, free from evidence of past human activities and with very infrequent encounters with other users. The user has outstanding opportunities to travel cross-country utilizing a maximum degree of primitive skills, often in an environment that offers a high degree of challenge and risk.
Primitive	This class is characterized by essentially an unmodified natural environment. Concentration of users is low and evidence of human use is minimal. This class is managed to be essentially free from evidence of human-induced restrictions and controls. Only essential facilities for resource protection and safety are used and constructed of native or natural materials. No facilities for comfort or convenience of the user are provided. Visitors are encouraged to disperse to desirable existing sites to minimize contacts with other groups. This class provides an high opportunity for exploring and experiencing considerable isolation, solitude, and self-reliance through application of primitive recreation skills in an environment that offers a high degree of challenge and risk.

[1]FSM 2320 R6 Supplement No. 81.

Table III-P-3.Cont. Wilderness Resource Spectrum Class Descriptions [1]

Classification Type	Descriptions
Semiprimitive	This class is characterized by a predominately unmodified natural environment of moderate size. Concentration of users is low, but there is often evidence of other users. This class is managed in such a way that minimum on-site controls and restrictions may be present but are subtle. Facilities are only provided for the protection of Wilderness resource values rather than visitor comfort or convenience. Materials should be natural or natural appearing. In this class moderate opportunities for exploring and experiencing isolation from the sights and sounds of other users; independence; closeness to nature; tranquility and self-reliance through the application of no trace and primitive skills in a natural environment that offers a moderate to high degree of challenge and risk.
Transition	This class includes areas that are characterized predominantly by conditions of relatively concentrated use where encounters with other groups are frequent, opportunities for solitude are limited, and user controls may be highly evident. This zone will provide opportunities for one to pursue satisfaction of one's outdoor recreational needs within a wilderness setting. However this zone will provide experiences in the low to moderate range for isolation, solitude, challenge, and primitive recreation.

[1]FSM 2320 R6 Supplement No. 81.

The WRS management framework establishes classes within the Wilderness based on such criteria as current conditions of use, density of camping sites, and presence of trails. Figure III-P-4 illustrates the current acreage of each WRS class and trail mileage within each Wilderness. Figure III-P-5 shows the capacity of each Wilderness, as currently inventoried, to accommodate human use in RVDs and maximum number of persons at a given time. Figure III-P-6 illustrates the location of each Wilderness in the Forest and the spatial distribution of inventoried WRS classes.

Table III-P-4. Inventoried Wilderness Opportunities by WRS Class[1]

	Pristine		Primitive		Semiprimitive		Transition		Totals	
Wilderness	Acres	Trial Miles	Acres	Trials Miles	Acres	Trail Miles	Acres	Trial Miles	Acres	Trail Miles
Bull of the W	6,314	0.0	1,152	9.5	0	0.0	0	0.0	7,466	9.5
Mt. Jefferson	55,778	0.0	6,015	49.5	8,084	77.0	2,688	12.4	72,565	138.9
Middle Santiam	7,167	0.0	299	2.5	725	6.0	362	3.0	8,553	11.5
Menagerie	4,011	0.0	341	2.0	597	4.9	0	0.0	4,949	6.9
Mt. Washington	37,349	0.0	1,813	15.2	1,834	14.2	0	0.0	40,996	29.4
Three Sisters	146,793	0.0	22,994	190.5	9,044	74.8	10,515	70.4	189,346	335.7
Waldo Lake	27,132	0.0	5,119	42.3	4,181	27.7	725	4.0	37,157	74.0
Diamond Peak	14,803	0.0	3,285	27.3	1,493	12.8	192	0.5	19,773	
TOTALS	299,347	0.0	41,018	338.8	25,958	217.0	14,482	90.3	380,805	646.1

[1]Information pertains only to the Willamette National Forest.

Table III-P-5. Inventoried Wilderness Capacity by WRS Class[1]

	Pristine		Primitive		Semiprimitive		Transition		Total Area Capacity[2]	
Wilderness Area	RVD	PAOT	RVD	PAOT	RVD	PAOT	RVD	PAOT	RVD	PAOT
Bull of the Woods	26	1-5	300	5-35	0	0	0	0	326	6-40
Mt. Jefferson	6,258	25-42	28,517	117-168	37,012	228-345	6,406	23-111	78,193	393-666
Middle Santiam	227	2-5	320	8-9	946	8-45	6,258	51-67	7,769	69-126
Menagerie	107	1-3	152	1-8	904	8-37	0	0	1,163	10-48
Mt. Washington	2,920	16-28	5,568	51-56	11,336	88-113	0	0	19,824	155-197
Three Sisters	23,305	60-110	104,408	372-570	63,118	287-392	83,326	490-782	274,157	1,209-1,854
Waldo Lake	1,020	12-20	7,947	98-159	18,374	151-207	8,390	69-81	35,731	330-467
Diamond Peak	996	7-11	8,419	64-102	6.642	51-83	3,213	10-32	19,270	154-227
TOTAL WRS CAPACITY	34,859	124-224	155,631	716-1,107	138,350	821-2,473	107,593	643-1,073	436,433	2,326-3,625

[1]Information pertains only to Willamette National Forest.
[2]RVD = Recreation Visitor Days and PAOT = Persons-at-one-time.

Forest Service researchers have been working on a process for establishing acceptable levels of Wilderness use called Limits of Acceptable Change (LAC) system. This concept does not propose to eliminate all changes to Wildernesses caused by human use, but recognizes that impacts can be the result of the specific kind of use, user behavior, and the season and distribution of use. The LAC System calls for inventories of existing conditions in each Wilderness and the comparison of existing conditions to the standards and guidelines for each WRS class. The Forest is currently in the process of conducting LAC inventories with an emphasis on areas sustaining heaviest use: Mt.Jefferson, Three Sisters, and Mt.Washington Wildernesses.

Initial findings of LAC inventories in these Wildernesses indicate that specific areas and trail corridors are receiveing use in excess of capacity as determined by WRS class management standards and LAC indicators. These findings further suggest that estimated capacity of some WRS classes in most Wildernesses, as currently inventoried, are overstated when compared with current use levels and physical resource conditions of Wilderness. A listing of specific areas and trails where use capacity is being exceeded and the effects of overuse are present can be found in discussions of each Wilderness later in this section.

Expansion of Wilderness opportunities in the Forest for this cycle of planning include one unroaded area near the community of Blue River. The area is known as the Mt. Hagan roadless area and is 6,292 acres in size. Mt. Hagan is the only area to be addressed as potential Wilderness in the Forest planning process. This area was included as recommended Wilderness in one alternative in the DEIS: Alternative C. The inclusion of the Mt. Hagan area as potential Wilderness is based upon the criteria set forth by Congress in the Oregon Wilderness Act of 1984.

The Oregon Wilderness Act of 1984 directs that for the initial National Forest Management Act (NFMA) land management plans the National Forest lands in Oregon which were reviewed in RARE II or in unit plans and roadless lands which are less than 5,000 acres in size have had adequate consideration of their suitability for inclusion in the National Wilderness Preservation System. The Department of Agriculture will not be required to review the Wilderness option prior to the revision of the plans, but will review the Wilderness options when the plans are revised, ordinarily on a 10-15 year cycle (Section 7(b)(2) Oregon Wilderness Act of 1984). The roadless lands will be managed for multiple use in accordance with the land management plans, and they need not be managed for the purpose of protecting their suitability for Wilderness designation prior to or during revision of the land management plans (Section 7(b)(3) Oregon Wilderness Act of 1984).

The Mt. Hagan area was neither reviewed in RARE II nor evaluated in a Forest Unit Plan and therefore must be considered for the Wilderness option in the current planning process. The WRS inventory indicates the Mt. Hagan area is suitable for providing primitive Wilderness opportunities. See Appendix C for a description of this area.

The unique ecosystemic contributions that Wilderness lands make to the ecology of the Western Cascades and Willamette Valley include significant influences on maintenance of high quality air and water; protection of habitats required by diverse animal species; and conservation of vegetative diversity through protection of representative plant communities. Establishment of several Research Natural Areas within Wilderness boundaries is reflective of the research value of the Forests Wildernesses. A Research Natural Area has been established within the Middle Santiam Wilderness boundaries, and RNAs are proposed for establishment in the Three Sisters Wilderness (McKenzie Pass RNA) and the Waldo Wilderness (Torrey-Charlton RNA).

Specifically, Wilderness lands are critical to continuance of high water quality which has direct bearing on terrestrial and aquatic species dependent on water and riparian habitats, and are primary factors in maintaining floral and faunal diversity. Without Wilderness lands, there would be a significant decline in species richness and abundance. These designated lands are a mixture of all forest types ranging from low to high elevations and encompassing forested and nonforested communities including meadows, sub-alpine, and alpine types. For example, the Menagerie Wilderness, Middle Santiam Wilderness, and the French Pete section of the Three Sisters Wilderness are prime low elevation lands with significant stands of old-growth Douglas-fir. Species preferring this kind of habitat are Northern Spotted Owls, wolverines, peregrine falcons, and bald eagles. Other animals favoring wild lands, especially along the crest of the High Cascades, are martens, fishers, and cougars.

Wilderness lands along the crest of the High Cascades (Three Sisters, Mt. Jefferson, Mt. Washington) are important as high use summer range for herds of deer and elk that winter on both sides of the summit. Because of this shared summer range, interbreeding between mule-deer and black-tailed deer occurs. These designated Wilderness lands serve also as an unbroken corridor for plant migrations and genetic exchange. They are an important transition zone between east and west sides; in addition, the mechanics of wind and water in the river corridors are dispersal agents for seeds and pollen from Wilderness plant communities out into managed lands.

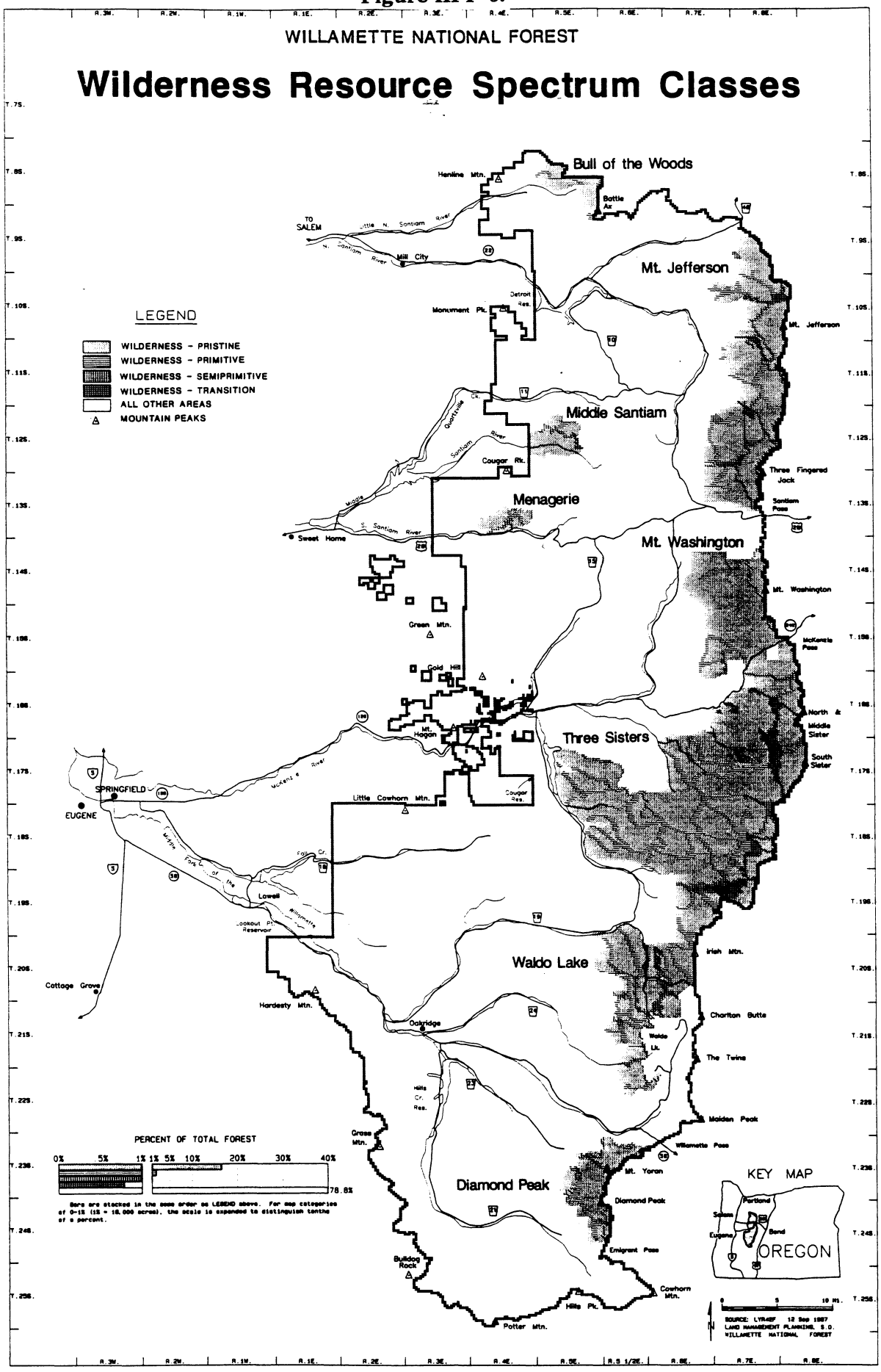
Wilderness lands are intact natural systems and, therefore, reservoirs of natural processes such as nutrient cycling, geologic events, etc. In addtion, they are repositories of natural genetic stock and variability providing the ecosystem with vigor and protection against disease. They are a baseline against which we can compare managed lands not only on a short-term basis, but in the face of such significant trends as global warming, on a larger scale.

Within Wilderness boundaries is scattered evidence of prehistoric and historic cultural behavior. Remnants of cabins, homesteads, old roads and livestock trails frequently can be found especially in Wildernesses, primarily due to the undeveloped status of the land. Evidence of aboriginal use of the land can often be seen in deposits of chipping waste and fragments of stone tools. Many of these cultural resources have been inventoried and are protected by the same legislation that directs cultural resource preservation and management on other parts of the Forest.

Primary issues that currently concern the public regarding Forest Wilderness lands do not diverge much from issues and concerns following publication of the DEIS in 1987. Briefly, the public is concerned with natural processes, social and resource impacts, trails and access, information sharing and public involvement, and regulation of use. Specifically, the Forest has been asked to address issues of recreational impacts from commercial and individual users to Wilderness ecosystems at popular areas and the effects of these impacts on other Wilderness values such as wildlife, plants, ecological processes; trail and sign maintenance and map updates; regulating Wilderness use through permit or registration procedures, thus, reducing impacts; enforcement needs.

The Forest will continue to involve the public in the Wilderness management process through consultation and communication during all levels of decision making.

Figure III-P-6.



Bull of the Woods Wilderness

The Bull of the Woods Wilderness was established by the Oregon Wilderness Act of 1984. This 33,851 acre Wilderness is located in the Willamette (7,466 acres) and Mt. Hood (26,385 acres) National Forests, approximately 68 miles southeast of Portland and 65 miles east of Salem. In the Forest this area is accessible from the west by the Little North Santiam Road, by French Creek Road on the south, and Elk Lake Road on the east.

The area is characterized by steep mountainous terrain dissected by numerous mountain streams. Within the Wilderness are the headwaters of the Collawash, Breitenbush, and Little North Fork of the Santiam Rivers. Elevations range from 1,600 to 5,560 feet. Lower slopes are typically covered by dense stands of Douglas-fir and western hemlock while upper slopes are forested with Douglas-fir, true fir and mountain hemlock. Rocky slopes and outcrops are common on upper slopes and are often associated with a shallow soil layer. There are several small lakes scattered throughout the Wilderness, many supporting an abundance of fish. These lakes are usually isolated from one another by steep, high ridges. Nongame wildlife species are varied and abundant; however, big-game populations are sparse.

Recreational opportunities within the area are hiking, horseback riding, backpacking, mountain climbing, fishing, hunting, rockhounding, and nature study. The Bull of the Woods Lookout is one of the most heavily used areas in the Wilderness as it commands a 360 degree view of the surrounding area. Mine shafts, old pieces of equipment, and other evidence of the area's mining history are found in this Wilderness.

Recreation use of the Bull of the Woods Wilderness consists primarily of hiking, camping, and fishing. The most popular trail in this Wilderness under the administrative jurisdiction of the Forest, meanders from Battle Axe Creek over to Whetstone Mountain to Gold Creek. At this time the trail receives only light recreational traffic.

There are many physically-challenging recreation opportunities in Bull of the Woods Wilderness, particularly during cross-country travel. In the upper elevations above the continuous stands of timber, the variety of terrain, the scenery and excitement of travel provide excellent mountaineering experiences. A sense of spaciousness and solitude can be experienced within most of this Wilderness.

Bull of the Woods Wilderness maintains the flow of high quality water in the Little North Santiam watershed which is the main water supply for the City of Salem in-take. In addition, the Little North Santiam which originates in the Wilderness is one of the few free-flowing streams in the Forest that supports an anadromous fish population.

Mt. Jefferson Wilderness

The Mt. Jefferson Wilderness is jointly administered by the Willamette (72,565 acres), Deschutes (32,734 acres) and the Mt. Hood)(3,793 acres) National Forests. The Wilderness extends approximately 25 miles in a north/south direction along the crest of the Cascades with portions of the area in Jefferson, Linn, and Marion Counties. The area is approximately 60 miles southeast of Salem and 40 miles northwest of Bend, Oregon. U.S Highway 20 parallels the southern boundary and Oregon State Highway 22 parallels the western boundary.

This area was originally established as Mt. Jefferson Primitive Area in 1930; when Congress passed Public Law 90-548 in 1968, it was designated as Mt. Jefferson Wilderness and with passage of the 1984 Wilderness Act, the size of the Wilderness was expanded to 109,029 acres.

Scenic highlights in this region are two steep-sided volcanic cones: Mt. Jefferson (10,497) is located to the north and Three-Fingered Jack (7,841) is located in the south. As is common with rapidly decaying volcanic mountains, the lower slopes of these peaks are covered with talus and deposits of pumice and glacial debris on which dense conifer forest begin to occur. These slopes are dissected by stream valleys that are predominantly U-shaped as a result of previous glacial erosion. At the heads of these U-shaped valleys are the formations of bare glacier-formed piles of rocks known as moraines. Moraines often form natural dams creating small lakes from the glacial run off. Above the timberline where the moraines occur, only alpine plant species are present. These include: subalpine fir, mountain hemlock, and various shrub and ground cover species. The middle elevations between 3,000 and 5,000 feet support subalpine types, consisting primarily of silver and white fir, lodgepole and whitebark pine and mountain hemlock. The lower elevations below 3,000 feet support Douglas-fir, Ponderosa pine, western hemlock, white fir, and juniper.

Mt. Jefferson Wilderness provides favorable habitat for many species of wildlife and fish indigenous to the Oregon Cascades. The Pacific Crest National Scenic Trail provides major access to the area. Fishing quality and hunting attract numerous visitors as the early High Cascade deer hunting season allows visitors to combine hunting and fall fishing.

Due to the area's easy accessibility, it has become very popular for day use and overnight visitors. Ease of access along with the growing demands for high quality outdoor recreation activities have resulted in the Wilderness receiving use in excess of its capacity in some areas. Signs of resource damage such as soil compaction, destruction of vegetation, loss of ground cover, declining water quality, and use of snags for firewood are becoming apparent. These impacts are especially severe in the subalpine areas where the growing season is short and damaged areas recover slowly. Areas that have received the greatest impacts from recreational use are: Jefferson Park, Pamelia Lakes, Hunts Cove, Marion Lake, Mowich Lake, duffy Lake, Santiam Lake, Square Lake, Wasco Lake, Cabot Lake, Ann Lake, Carl Lake, Canyon Creek Meadows, Rockpile Lake, Shirley Lake, Long Lake, Lower Berley Lake, Jorn Lake, Blue Lake, Bowerman Lake, Red Butte, Dixie Lakes, Lake of the Woods, Jenny Lake, Prill Lake, Swallow Lake, Crown Lake, Turpentine Lake, Ruby Lake, the Eight Lakes Basin, and the Pacific Crest National Scenic Trail corridor.

Water quality and purity in the Mt. Jefferson Wilderness affect the heavily-used Breitenbush River recreation area. High water quality, cold temperatures, and excellent clarity enhance this publically-popular downstream zone.

In spite of heavy localized use and the visible effects which can result, the Mount Jefferson Wilderness is an area of outstanding beauty and scenery. It offers backpacking on miles of shady trails, mountaineering on Oregon's second highest peak, horseback riding, fishing, hunting, and many other wilderness-oriented recreational activities.

Middle Santiam Wilderness

The Middle Santiam Wilderness was established by the Oregon Wilderness Act of 1984. This 8,553 acre area is located in Linn County within the Sweet Home Ranger District and is bordered by National Forest lands on its north, south, and east boundaries and by private timber lands to the west. The west portion of this area is accessible by private roads and from other directions by National Forest roads.

Located within the Wilderness boundaries is the Middle Santiam Research Natural Area near Chimney Peak which includes representative old-growth stands of 450+ years Douglas-fir and western hemlock. Research issues being addressed at the RNA are productivity of old-growth forests and their significance

as wildlife habitat; composition and successful development of forest communities; and the role of coarse, woody debris in stream stabilization.

Elevations in this area rise from 1,600 to over 5,000 feet. Topographically, there is an abundance of gentle slopes and benches that rise to form dissected steep slopes, ridges, and high peaks. Vegetation varies from true fir associations at the higher elevations to the Douglas fir/western hemlock associations at the lower elevations. The Middle Santiam River transects the area and has several small tributary streams feeding into it.

Recreational opportunities include hiking, backpacking, berry picking, fishing, hunting, horseback riding, rock hounding, and nature study. Wildlife species are varied and plentiful in the area. Big game populations are moderate with the elk population especially showing an increase. Chimney Peak, Knob Rock, the Middle Santiam River and Donaca Lake are prominent features in the Middle Santiam Wilderness.

Timber harvesting activities on lands around the perimeter of the Wilderness could detract from a visitor's sense of remoteness and feeling of solitude within the Wilderness. Possible overuse is occurring along the Chimney Peak and Gordon Peak Trails which lead to Donaca Lake. Signs of this include soil compaction or increased erosion and loss of vegetation. Increased numbers of people using the trails have also affected opportunities for solitude, and may limit some forms of primitive recreation.

Intense management of private lands in the vicinity of the Wilderness have amplified the importance of the designated lands in maintaining the high water quality required by downstream users. Protection of the watershed and related fisheries through Wilderness designation is critical. In addition to its hydrologic value, the Middle Santiam Wilderness is important as a potential low elevation old-growth habitat for such wildlife species as: Northern Spotted Owls, wolverines, peregrine falcons, and bald eagles.

The Middle Santiam Wilderness area contains approximately 12 miles of trails that provide opportunities that range from nonstrenuous low elevation hiking to middle elevation backpacking, or off-trail mountaineering. Whatever the interests of the individual might be, the area's combination of rivers, streams, forests, peaks, and lakes offer a variety of Wilderness use opportunities.

Menagerie Wilderness

The Menagerie Wilderness was established by the Oregon Wilderness Act of 1984. This area is located in Linn County within the Sweet Home Ranger District. Access is primarily from trails originating at points along U.S. Highway 20, the area's southern boundary.

The Menagerie Wilderness is 4,949 acres in size and is characterized by steep dissected slopes. Smaller areas of more gentle slopes are present. The Rooster Rock area in the Menagerie Wilderness has a series of pinnacles that rise above the surrounding landscape; Rooster Rock is the largest. These basalt spires offer some of the most challenging rockclimbing opportunities in the Western Cascades. Elevations in the Wilderness range from about 1,600 to 3,560 feet.

Vegetation consists predominantly of the Douglas-fir/western hemlock association with few natural openings. Two streams supporting native cutthroat trout populations drain from the area. Black-tailed deer are the most usual big-game species with resident herds of elk depending on the area as winter range.

Included within the designated boundary are 85 acres of privately owned land. Except where private lands adjoin the Wilderness boundary to the north, much of the Menagerie Wilderness is bordered by National Forest lands.

Recreational opportunities include day use activities such as fishing, hunting, hunting, sightseeing, hiking, and nature study. The area has some opportunities for low elevation trail hiking and has approximately seven miles of developed trails. Current use patterns indicate that the trails from Trout Creek and Fernview Campgrounds into the Wilderness receive the heaviest use, primarily for day hiking. These trails show few effects from recreationists, although evidence is beginning to accumulate that the main ridges leading to the rock spires may receive use in excess of capacity.

Although the topography and dense vegetation make the area physically challenging, the experience of solitude and spaciousness is limited because of the area's size and its proximity to the highway and industrial activities.

Mt. Washington Wilderness

The Mt. Washington Wilderness is located in Deschutes County in the Deschutes (13,356 acres) National Forest and Lane and Linn Counties in the Willamette (40,996 acres) National Forest. The summit of the Cascade Range runs north and south through the Mt.Washington Wilderness, forming the east boundary of the Forest.

The Mt. Washington Wilderness was first established as a "Wild Area" in 1957, and as a Wilderness by the Wilderness Act of 1964. The area was recently enlarged to 54,559 acres by the Oregon Wilderness Act of 1984. This Wilderness is accessible on the south from the McKenzie Highway which forms a part of the south boundary. On the north it is easily reached by the Big Lake Rd. and the Old Santiam Wagon Road. On the west side, access is provided by several Forest Service roads and U.S. Highway 126. The main entrance point on the south is at the Pacific Crest National Scenic Trail (PCNST) crossing on McKenzie Pass Highway (State Highway 242). This point accesses immense lava flows originating from Belknap Crater and Little Belknap Crater.

The Mt. Washington Wilderness area offers varied recreational opportunities for the High Cascades traveler. Its diverse terrain ranges from forest, to lava beds, to scree slopes, to the steep vertical walls of Mt. Washington itself.

The principal attraction within the area is Mt. Washington, a spectacular peak, with an elevation of 7,802 feet. Wilderness trails provide hikers with excellent views of Mt. Washington's extensive lava beds and scenic views of other mountains and forested areas. Other popular activities include hunting on the east and west sides of Mt. Washington where deer are plentiful, and fishing at Patjens Lakes.

The gently sloping terrain would be ideal for camping were it not for the scarcity of water. Water supplies are practically nonexistent in the area because of the high permeability of the volcanic rock and soil. Over half of the Mt. Washington Wilderness area is lava flows covered occasionally by grass and low-growing shrubs, although vegetative cover varies with elevation. Lodgepole pine and true fir-mountain hemlock cover types are the most widespread, with Douglas-fir comprising less than 7% of the total area.

The Belknap lava field covers approximately 10,000 acres of the Mt. Washington Wilderness. Most of the lava flow is characterized by jumbled blocks of solidified magma with bristling, jagged surfaces. Visitors should be especially cautious on the lava flows where the unwary risk injury on sharp, rough rocks. Climbing of the mountain itself requires exacting safety precautions with the final ascent through

chimneys and vertical rock faces. Due to the technical difficulty of the climb and friable nature of the rock, the summit of Mt. Washington was not conquered until August of 1923.

Specific locations in the Mt.Washington Wilderness appear to be receiving use in excess of capacity. They are: Benson Lake, Tenas Lake, Hand Lake, George Lake, Patjens Lake, and the Pacific Crest National Scenic Trail corridor. Overuse is indicated by compaction and erosion of soil, destruction of vegetation, reduction of water quality, and the use of dead woody material and snags as fuel for campfires. These impacts are especially severe in subalpine zones where the environment is slow to recover. In these same areas, opportunities for solitude and primitive recreation are declining due to increasing numbers of users.

Three Sisters Wilderness

The Three Sisters Wilderness was first established as a 184,820 acre Primitive Area by the Chief of the Forest Service in 1937. In 1938, it was enlarged to include 56,000 acres of Forest land located between Horse Creek and the South Fork of the McKenzie River. In 1957, the area was reclassified as the Three Sisters Wilderness by the Secretary of Agriculture under Regulation U-1. At this time, 53,000 acres of the 56,000 acres added to the Primitive Area in 1938 were excluded from Wilderness classification. The Three Sisters Wilderness was given Congressional designation with passage of the National Wilderness Preservation Act of 1964. The American Endangered Wilderness Act of 1978 added to the Three Sisters Wilderness 47,200 acres of the 53,000 acres deleted from the Primitive Area upon its classification as Wilderness in 1957. The most recent addition to the Three Sisters Wilderness resulted from passage of the Oregon Wilderness Act of 1984. Through this Act, the total allocation was enlarged to its present size of 283,593 acres. Management of this Wilderness is shared by the Willamette (189,346 acres) and the Deschutes (92,706 acres) National Forests.

The western portion of the proposed McKenzie Pass Research Natural Area is located partially in the Three Sisters Wilderness. Refer to the FEIS, Chapter III for a description of the RNAs on the Forest.

Access to the Three Sisters Wilderness is by trails and Forest roads that originate from State Highway 242 on the north; Cascade Lakes Highway on the east; Waldo and Irish Taylor Roads on the south; East Fork Road and Aufderheide Drive (Forest Road 19) on the west.

Favorite recreational activities include fishing, hunting, nature study, mountain climbing, camping, hiking, and horseback riding. The Wilderness trail system traverses the Wilderness from north to south providing outstanding views of subalpine country, the Three Sisters, and other prominent peaks and cones along the Cascade Crest. Trails pass through fir, hemlock, and lodgepole pine stands on the north and south ends of the Wilderness and have evolved from earlier sheep driveways, firefighters' way trails, packers' routes, and fishing trails. One-day hiking and riding trips are possible in the peripheral areas such as Proxy Falls, Linton Lake, Sunshine Meadows, Sister's Mirror Lake, Horse Lake, and Green Lakes. Backpackers as well as riders with packstrings can spend many days exploring the more remote interior areas.

Fishing is a favorite recreational activity in the Mink Lakes Basin which contains a cluster of about 60 lakes surrounded by fir, mountain hemlock, and lodgepole pine forests of the southern portion of the area. Mink Lake at 360 acres is the largest in the Wilderness. These areas are showing signs indicating use in excess of capacity.

Originally constructed by the Civilian Conservation Corps for the convenience and safety of hikers and riders are five historic trail shelters, located at James Creek, Cliff Lake, Mink Lake, Buck Meadows,

and Muskrat Lake. All but Muskrat Lake are considered eligible for listing on tthe National Register of Historic Places.

A recreational activity that has become very popular over the past few years is mountaineering. The volume of climbing traffic particularly on the Three Sisters peaks has become heavy. On midsummer weekends it is often necessary to wait for preceding parties to pass through certain exposed areas on popular North Sister routes. Due to this overcrowding on the summits, climbing accidents as well as litter have become a problem. Climbing camps that receive considerable day use are located at the Sunshine Meadows-Obsidian area below North and Middle Sister, and the Green Lakes area between South Sister and Broken Top. North Sister at 10,094 feet is most difficult of the Three Sisters to climb while Middle Sister (10,053) and South Sister(10,354) are not technically difficult climbs.

The mosaic of forest, meadows, and openings within the Wilderness is a complex response to the interaction of climatic, soil, and geologic factors, insect and disease outbreaks, and fire. In the lower elevation canyon country on the west side of the summit there are extensive stands of Douglas-fir. On both sides of the crest in higher elevations true fir, mountain hemlock, and lodgepole pine stands prevail while timberline and subalpine areas are characterized by clusters of slow growing subalpine fir, mountain hemlock, and an occasional whitebark pine. Meadows and openings interspersed with the scattered trees in this zone form a scenic setting which is generally favored by recreation users.

The Three Sisters Wilderness is favorable habitat for black-tail deer, mule deer, Roosevelt elk, and black bear. Elk are generally from the herds that winter in the South Fork McKenzie River, and North Fork Willamette River areas, often ranging as far east as Tumalo Creek and Crane Prairie Reservoir.

Linton Meadows is the most popular area for early season deer hunting and winter elk hunting. Mule deer, black-tail deer, and elk inhabit the area in and around the meadows and on Lane Plateau. Hunters often hike or ride in by way of Obsidian Trail, Frog Camp, or from Lava Camp on the Pacific Crest National Scenic Trail. The patient observer can see many other indigenous mammals such as marten, coyote, fox, mink, weasel, bobcat, beaver, and badger. Birds typical of the Wilderness include Clark's nutcracker, gray jay, Stellar's jay, common raven, turkey vulture, hairy woodpecker, winter wren, Oregon junco, red breasted nuthatch, and chestnut-backed chickadee. Hawks, owls, osprey, bald and golden eagles, waterfowl, and shorebirds also prefer the high elevation habitat.

The effects of overuse in the Three Sisters Wilderness can be seen in environmental degradation and increasing resource damage. Locations exhibiting these effects include: Sunshine/Obsidian Falls, Arrowhead Lake, Eileen Lake, Husband Lake, Linton Meadows, Lower Linton Meadows, Linton Lake, Otter Lake, Erma Bell Basin, Proxy Falls, Sisters Mirror Lake, Horse Lake, Golden Lake, Moraine Lake, Chambers Lake, Park Meadow, Buck Meadows Shelter, James Creek Shelter, Cliff Lake Shelter, Rebel Rock Lookout, Muskrat Lake Cabin, Mesa Creek, Blow Lake, Doris Lake, Hinton Springs, Honey Lakes, Nash Lake, Porky Lake, South Sister Climbing Trail, Mink Lake and Mink Lake Shelter, North and South Matthieu Lakes, Soap Creek Crossing, Camp Lake, Green Lakes, Ollalie Guard Station, Olallie Lookout, the Pacific Crest National Scenic Trail corridor, and Lower French Pete Trail. Also past commercial grazing and the presence of nonconforming facilities within the Wilderness have affected the environment and Wilderness experiences

The effects of more than a half century of fire protection are apparent in the succession which is taking place in many of the fire-formed openings. Lodgepole pine and mountain hemlock are filling in these openings which resulted from fire, insect epidemics, or other natural processes. Some of this succession may be influenced by recent climatic events.

Mountain pine beetle and white pine blister rust are found in the western white pine which is a minor element in the Douglas-fir and true fir/mountain hemlock stands. Balsam woolly aphid infestations slightly near the epidemic stage have occurred in some stands of true firs at upper elevations. Other biological disturbances particular to this area include *Phellinus* (root rot) in mountain hemlock stands, and western spruce budworm.

A water power withdrawal covering Horse Creek and Separation Creek is in effect. The U.S. Army Corps of Engineers has made a preliminary proposal for a flood control dam outside the Wilderness. If constructed, the dam would back water into the Wilderness in Horse and Separation creeks.

Waldo Lake Wilderness

The Waldo Lake Wilderness was established by the Oregon Wilderness Act of 1984 and is located entirely within Lane County and the Forest. The area lies 20 miles to the east of Oakridge, directly north of Highway 58 and west of Waldo Lake Road. Primary access points include: Taylor Burn, North Waldo, and Shadow Bay campgrounds; Forest Service roads in Furnish Creek, Salmon Creek, and Black Creek drainages; and trailheads located along the upper end of Road 19 and the Waldo Lake Road. Prior to 1984, the area was managed as the Waldo Lake Recreation Area.

The Waldo Lake Wilderness includes 37,157 acres of Oregon's High Cascades between the volcanic remnants of the Three Sisters and Diamond Peak. Waldo Lake, adjacent to the Wilderness, is a most prominent feature and a popular recreation destination. The lake was named after Judge John B. Waldo, a Pioneer son who died in 1907.

Elevations range from 2,800 feet to over 7,100 with an average elevation of approximately 5,000 feet. Generally, topography can be described as gently rolling foothills, except in the northwest portion where the North Fork Willamette drainage breaks up the area to form steep dissected slopes.

Wilderness lands include more than 200 small lakes, ranging in size from small seasonal ponds to the 100 acre Lower Eddeeleo Lake. Almost all of the larger lakes in the area contain fish, and planting of fish in the more popular lakes by the Oregon Department of Fish and Wildlife commonly occurs. The majority of the lakes have rocky shorelines and are set in small basins surrounded by unbroken stands of timber, providing maximum seclusion for anglers and other visitors. Water clarity and purity in Waldo Lake, Oregon's second largest lake, is dependent on maintenance of high water quality within the Wilderness.

Stands of mountain hemlock, lodgepole pine, true fir, Douglas fir, western hemlock, and some true fir associations are typical of the Wilderness. Natural openings of shrub, grass/forb types are present. Many small streams originate in these openings and flow to the larger tributaries of the North Fork of the Middle Fork of the Willamette River. A variety of birds, animals, and amphibians inhabit the area, while deer and elk summer in the meadows and adjacent forested lands.

Hunting activity is light in the eastern part of the area, and heavier in the west. The upper end of the Black Creek drainage and North Fork of the Middle Fork of the Willamette River are the most popular deer and elk hunting areas with easy access and transport of game occurring by boating across Waldo Lake.

Many other recreation activities are available including: hiking, backpacking, horseback travel, boating, scenic viewing, hunting, fishing, wildlife observation, photography, and nature study. Unusual geologic features and indigenous plants add to the diversity of the area.

Nonconforming facilities in the Wilderness such as Waldo Mountain Lookout, Black Meadows Cabin, and Fuji Mountain Cabin may intrude on the natural landscape. There is some concern that certain locations are receiving recreation use beyond their capacity. Areas that show environmental degradation are: Eastern Brook Lake, Winchester Lake, Gander Lake, Wahanna Lake, Rigdon Lake, Kiwa Lake, Six Lakes, Torrey Lake, Whig Lake, Quinn Lakes, Long Lakes, Swan Lakes, Salmon Lakes, and Eddeeleo Lakes. Increasing numbers of visitors are affecting opportunities for solitude and primitive recreation. Some trails are also beginning to exhibit signs of overuse including: Winchester Trail, Rigdon Lakes Trail, Black Creek Trail, Six Lakes Trail, Wahanna Trail, Whig and Torrey Way Trails, and Salmon Lakes Trail. Evidence seems to suggest that commercial activities may be occurring in the Wilderness without permits. These activities may be adversely affecting the area through its use by excessive numbers of people in one location at the same time, groups too large for a wilderness setting, and increased probability of site damage from concentrated horse use.

Forest Service trails and trail structures, mountaintop land survey control points, and abandoned Forest Service lookout stations are evidence of human activities. In addition, old campsites are evident in meadows and near lakes. Industrial activities and the resulting change in visual quality of adjacent lands are visible from within the area along the northern and western boundaries.
The Torrey-Charlton proposed Research Natural Area, within the Waldo Lake Wilderness boundaries, was proposed in the 1977 Forest Multiple Use Land Management and Timber Management Plan. An establishment plan for the area is close to completion.

Diamond Peak Wilderness

The Diamond Peak Wilderness was first established as a "Wild Area" by the Chief of the Forest Service in 1957. The area was reclassified as Wilderness by the Wilderness Act of September 1964 and was recently enlarged to 52,773 acres by the Oregon Wilderness Act of 1984. Management is shared with the Deschutes (32,964 acres) and the Willamette (19,773 acres) National Forests.

The Cascade Crest runs generally north and south through the area. Diamond Peak (8,744 feet) is the most prominent point and dominates the Wilderness. This is a massive, barren mountain consisting of at least three major peaks with broad ridges extending east and west as well as along the Cascade Crest. Blocky lava, pumice, and red cinders cover the slopes above 7,200 feet in elevation. There are two other significant volcanic peaks within the area: Mt. Yoran, just to the north of Diamond Peak, and Lakeview Mountain near the east boundary.

The west slope of the Cascades is broken by many drainages and drops steeply to several lakes just within the Wilderness boundary. To the north of Mt. Yoran the ground tends to be characterized by benches and gentler ridges. Small meadows and potholes are typical. Near the north boundary the terrain breaks steeply to Salt Creek. The eastern portion, bounded on the north by Trapper Creek and on the east by Lakeview Mountain, is gently rolling terrain sloping gradually toward two ridges which form a basin at the foot of Diamond Peak.

Diamond Peak is an important watershed with drainages radiating in all directions. Trapper and Whitefish Creeks feed Odell and Crescent Lakes respectively. These streams and the ground water from nearly 20,000 acres are the major source for these lakes. Fall Creek and other drainages to the north feed Salt Creek and these with the many streams originating on the west slope, form a network of tributaries to the Willamette River. About 41 small lakes are scattered throughout the area, the largest of which is 27-acre Yoran Lake.

The area is generally snow covered from October to May. Summer days are usually warm and dry with temperatures near freezing at night.

The west slope of the Wilderness is heavily wooded with large stands of fir and hemlock. The remainder of the area is typically upper forest stands of true fir-mountain hemlock. A large band of lodgepole pine traverses the fir-hemlock stands in the eastern half of the area. The true fir-mountain hemlock understory is dense growths of dwarf manzanita or varieties of huckleberry. Little understory or ground cover is found beneath lodgepole pine stands.

Alpine flowers such mimulus, lupine, penstemon, and Indian paintbrush are common along the trails, streams, and lakeshores. Diamond Peak lakes are widely dispersed across the landscape, trails are usually in the timber, and opportunities for open meadow travel are scarce. Large areas of the Wilderness have no access trails; many sections of existing trail are unusually steep. One cannot circle Diamond Peak by trail within the Wilderness and much of the area is rugged so cross-country travel is challenging.

Rainbow and eastern brook trout have been planted in about 30 lakes. The area's streams offer only average fishing for various reasons including frequent water level and temperature fluctuations, lack of feed, and natural barriers. The lakes near the west boundary offer some of the best fishing and are just a short hike from access roads. On the east edge, there are no easily accessible lakes, but Odell and Crescent Lakes are near the Wilderness and many visitors to these areas enter the Wilderness for day hiking.

Black-tailed and mule deer, elk, and black bear inhabit the Wilderness. Deer and elk populations are limited by available forage. Wildlife populations are probably increasing on the western fringe of the Wilderness due to the number of timber harvest units on the Forest. Wildlife populations have remained stable on the eastern slopes. Both hunting and fishing pressure have been gradually increasing. Resident small mammals include marmot, snowshoe rabbit, pine squirrels, pine marten and pika. Birds found here are grouse, raven, Clark's nutcracker, Oregon jay, and water ouzel. In summer, numerous insectivorous birds and seed eaters frequent the area. Bufflehead and goldeneye ducks occasionally nest near the lakes.

Trails, bridges, and signs are the only improvements within the Wilderness. Many of the old trails were fishing or trapping trails which have been maintained by the Forest Service in essentially original locations. Consequently, trail grades are often steep with hazardous stream crossings, although Diamond Peak and Mt. Yoran provide fairly easy climbing routes which are popular with beginners. Wilderness trails often are in locations inappropriate to optimum user enjoyment, have poor drainage, and frequently duplicate routes to destinations.

There are two nonconforming cabin structures within the Wilderness boundaries and Vivian Lake seems to be receiving use in excess of its capacity.

The quality of Wilderness experience is good from the standpoint of solitude. However, noise from the Southern Pacific Railroad is heard in most of the eastern portion, particularly at night.

A light outbreak of balsam wooly aphid in the Wilderness at one time reached epidemic proportions around Odell Lake, but due primarily to change in timber type is not expected to cause major problems.

The Diamond Peak Wilderness is one of Oregon's most rugged and pristine wildernesses. The area's relative inaccessibility and diverse landscape truly can set the stage for a wilderness experience that offers the visitor solitude, challenge, and primitive recreation in many forms.

Future Trends

Future Wilderness use will likely be affected by changes in various socio-economic indicators (e.g., population growth, disposable income, leisure time, etc.), the availability of opportunities, technology, weather conditions and other variables. Due to large uncertainties about the variables affecting future use, projections become more tenuous as they are extended further into the future. However, to assess whether current Wilderness use capacity is adequate to satisfy future demand it is necessary to develop estimates for a 50 year planning horizon.

Participation in most activities has shown steady growth over the past decade and is projected to increase during the planning horizon. For all Wilderness Resource Spectrum classes, except for the Pristine class, the existing supply of opportunities is inadequate to meet current or future demand. Figure III-P-7 compares individual Wilderness and total Wilderness use for 1989 and projected 2040 use with current estimated capacity by WRS Class.

These comparisons on a Wilderness-wide basis indicate that Wilderness use, if permitted to increase, would exceed inventory capacity in the pristine class by 2030; primitive class by 2000; and transition class by 2010. Use in the semiprimitive class exceeds inventory capacity at this time. Supply and demand comparisons change considerably on an individual Wilderness basis. Current use in primitive areas exceeds capacity in three Wildernesses: Mt. Jefferson, Middle Santiam and Menagerie. In all other Wildernesses, except Bull of the Woods, current use also exceeds inventory capacity in the semiprimitive WRS class.

It may be necessary to regulate use and some types of activities in order to retain or restore Wilderness conditions where evidence of overuse is apparent or where such use is an impairment to Wilderness experiences. Mt.Jefferson, Mt.Washington, and Three Sisters Wildernesses have been identified as top priority areas with regard to establishing management strategies which will focus on achieving balance between capacity and use. The reconciliation of use and capacity will be critical in other Wildernesses as well.

Adjustments in the amounts or distribution of WRS classes, elimination of trail segments, or closure of specific areas would all directly affect use capacity of individual Wilderness. In addition the redistribution or changes in inventoried WRS classes would reduce current and future Wilderness use opportunities but would provide for enhanced user experiences and recovery of resource conditions.

Calculation of existing capacity assumes management of WRS classes as inventoried and current access to individual Wildernesses. In addition, as use increases above WRS class capacity levels the intended experience opportunities decrease. A reduced experience opportunity and the resource degradation associated with overuse can cause an area to effectively shift into a less primitive WRS Class. Rigorous application of the Wilderness non-degradation policy, adherence to WRS class management standards, and the "Limits of Acceptable Change" (LAC) principles are intended to prevent such an occurrence.

Overuse in many Wilderness areas is currently a serious problem. User education and regulating or modifying access (e.g., through permit systems, road and trail closures, etc.) are management options that may be employed to prevent further degradation and enhance user experiences.

Table III-P-7. Wilderness Capacity and Use Comparisons[1]

Wilderness Name	WRS[2] CLASS	RVD Capacity	1989 Use[3]	2040 Use[4]
Bull of the Woods	Pristine	26	9	36
	Primitive	300	267	564
	Semiprimitive	--	--	--
	Transition	--	--	--
Mt. Jefferson	Pristine	6,258	2,156	5,529
	Primitive	28,517	32,515	83,160
	Semiprimitive	37,012	39,390	104,114
	Transition	6,406	9,330	25,441
Middle Santiam	Pristine	227	60	144
	Primitive	320	476	1,409
	Semiprimitive	964	1,664	4,393
	Transition	6,258	1,220	3,249
Menagerie	Pristine	107	81	215
	Primitive	152	400	1,128
	Semiprimitive	904	1,701	4,832
	Transition	--	--	--
Mt. Washington	Pristine	2,920	1,574	3,948
	Primitive	5,568	3,301	8,457
	Semiprimitive	11,336	13,654	36,023
	Transition	--	--	--
Three Sisters	Pristine	23,305	9,481	24,412
	Primitive	104,408	66,840	170,268
	Semiprimitive	63,118	81,949	215,696
	Transition	83,326	34,459	93,199
Waldo Lake	Pristine	1,020	355	898
	Primitive	7,947	3,837	9,867
	Semiprimitive	18,374	20,933	55,352
	Transition	8,390	6,346	17,133
Diamond Peak	Pristine	996	284	718
	Primitive	8,419	2,728	7,047
	Semiprimitive	6,642	7,218	18.890
	Transition	3,213	3,245	8,714
TOTALS	Pristine	34,859	14,000	35,900
	Primitive	155,631	110,400	281,900
	Semiprimitive	138,350	166,500	439,300
	Transition	107,593	54,600	147,700

[1]Information pertains only to the Willamette National Forest.
[2]Wilderness Resource Spectrum (WRS) Class.
[3]1989 Use estimate.
[4]Proportional distrabution of projected use based on historical use patterns.

Wilderness managers will rely on a wide range of management strategies (such as registration, permits, use limitations) to restore any areas which are not within standards. Implementation and monitoring plans will be developed for each Wilderness on the Forest. Public input is invited throughout the process.

As Wilderness use increases the most desirable campsites and major attractions are affected. These areas are likely to incur impacts to vegetation, soil, and adjacent water features. Some forms of Wilderness use such as pack and saddle activities have a greater effect than average hiking groups. Pack and saddle users generally require larger campsites near water and meadow areas for stock maintenance purposes. In addition, commercial outfitters and guides tend to bring in larger groups with greater potential for impacting the isolation and solitude of smaller groups of users.

Land management activities, such as timber harvest, have the potential to cause localized effects along the boundary of the Forest's Wilderness. Timber harvest and road construction within view from Wilderness use areas may incur higher than normal costs due to attempts to minimize effects. Wilderness use in general can affect the location of new roads, may require road closures to maintain Wilderness character, and may require specific mitigation treatments in order to achieve management objectives of Wilderness.

Forest Wildernesses contain a wide variety of cultural resources, e.g. several shelters and cabins dating to the 1930s-1940s. The Wilderness Act directs that historic structures not be rehabilitated for long term preservation; these buildings will be evaluated, documented and allowed to deteriorate gradually, unless a definite safety or administrative problem develops. Evidence of prehistoric utilization of Wilderness lands can be found throughout the Forest and is of concern to Wilderness managers. As with historic resources, prehistoric resources are of regional importance to understanding land use patterns and human behaviors. Certain protective or data retrieval measures may be necessary in areas of heavy recreational use.

Efforts to suppress both lightning and human-caused wildfires have modified the role of fire in Wilderness ecosystems. Over time continued suppression of natural fires at small sizes will alter natural vegetative successional processes giving rise, in some cases, to a loss of meadows and open spaces through encroachment of surrounding tree species and in some areas a buildup of dead and down fuels. The Forest will continue to provide cost effective fire protection on Wilderness (and nonwilderness lands) by suppressing all fires with the least cost plus net value loss to resources. In the future, prescribed burning may be planned for areas in the Wilderness where natural ecosystem succession would be perpetuated or other resource objectives met without threatening adjacent nonwilderness lands.

Although the evidence of past fires is not always apparent, especially in the Western Cascades, most biological communities have evolved with the presence of fire. Within Wildernesses, the natural role of fire is most evident. Fire management plans for Wilderness lands will include consideration for re-establishing fire in its natural role as a major factor in retaining a variety of plant communities and overall ecosystem processes. During suppression of all naturally occurring fires in Wilderness, preference will be given, whenever possible, to methods that preserve Wilderness values and have the least physical impact on the land.

ROADLESS LANDS

Roadless areas are defined as areas or islands of "undeveloped Federal land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use. A roadless island is further defined as an area that is surrounded by permanent waters or that is markedly distinguished from surrounding lands by topographical or ecological factors such as cliffs, canyons, thickets, or swamps" (RARE II inventory criteria, USDA Forest Service).

Areas in an unroaded condition have been inventoried (see roadless area in glossary) on the Forest. Roadless lands are inventoried for the purpose of identifying areas within the Forest that meet minimum requirements for consideration as Wilderness. To achieve this purpose, criteria have been established to guide resource specialists in the inventory process. Specific criteria for size, area manageability, and nonconforming uses are used to determine whether an area qualifies for inclusion in the roadless area inventory.
The identification of roadless areas serves to highlight the environmental condition of specific areas within the Forest landscape, and to emphasize their potential for a wide range of multiple resource uses, including Wilderness. In addition, roadless inventories serve to make known the extent of the roadless resource and to provide a data base managers and legislators can use to formulate land management proposals and planners may use as to assess resource effects and trade-offs. Further such inventories provide the opportunity for thoughtful consideration and evaluation of an areas full potential and highest use through planning analysis and management decision processes.

Historic Trends

The subject of roadless areas gained prominence in the Forest during the early 1950s when Forest management began to intensify and the Chief of the Forest Service deleted a 53,000 acre area, known as French Pete, from the Three Sisters Primitive Area. Public concern intensified about French Pete and other roadless areas within the Forest during the following 30 years. In addition, the issue of preserving roadless areas for their wilderness character and primitive recreation opportunities has expanded to include concerns for providing adequate habitat to sustain viable populations (see the Wildlife section) of wildlife and fish, protecting sensitive soils and unstable lands; and maintaining representative ecosystems of the region and nation. The intensity and depth of public concern about how roadless lands would be managed were factors in the development of the RARE and RARE II processes as well as Wilderness legislation.

Figure III-Q-1 illustrates, for the Forest, changes in the amount of designated Wilderness and land inventoried as roadless during the past 25 years. Figure III-Q-1 also illustrates that roadless land have decreased as more Wilderness has been designated by Congress. However, decreases in roadless land are also due to Forest development activities such as road construction and timber harvest.

Table T033. Trends in Wilderness and Roadless Land Acreages (III-Q-1)

Current Subject	1964	1968	1973	1978	1979	1984	1984	Current Total
Wilderness	191,063[1]	254,744[1]	254,744	301,933[1]	301,933	301,933	386,863[1] [2]	386,863 [2]
Roadless Land	Unknown	Unknown	357,127[3]	304,927	301,227[4]	295,137[5]	210,207[5]	172,007[5]
Total Area Undeveloped	Unknown	Unknown	611,871	606,860	603,160	597,070	597,070	558,870

[1]Wilderness legislation enacted.
[2]Includes Oregon Cascades Recreation Area.
[3]Roadless Area Review and Evaluation (RARE - 1973).
[4]Second-Roadless Area Review and Evaluation (RARE II - 1979).
[5]National Forest Management Act (NFMA) Roadless Area Inventory.

Current Situation

Areas in roadless inventories have typically been evaluated for their suitability, availability and need as wilderness during formalized planning efforts such as Unit Planning, RARE or RARE II. This process has been validated, with some alteration, by the Oregon Wilderness Act of 1984 (P.L. 98-328). The Act designated 78,872 acres of inventoried roadless area on the Forest as new Wilderness and 6,292 acres of roadless land as the Oregon Cascades Recreation Area.

The Oregon Wilderness Act of 1984 directs that, for the initial National Forest Management Act (NFMA) land management plans, the National Forest lands in Oregon which were reviewed in RARE II, or in unit plans, and roadless lands which are less than 5,000 acres in size, have had adequate consideration of their suitability for inclusion in the National Wilderness Preservation System. The Department of Agriculture will not be required to review the Wilderness option prior to the revision of the plans, but will review the Wilderness options when the plans are revised ordinarily on a 10-15 year cycle (Section 7(b)(2) Oregon Wilderness Act of 1984).

The roadless lands will be managed for multiple use in accordance with the land management plans, and they need not be managed for the purpose of protecting their suitability for Wilderness designation prior to or during revision of the land management plans (Section 7(b)(3) Oregon Wilderness Act of 1984).

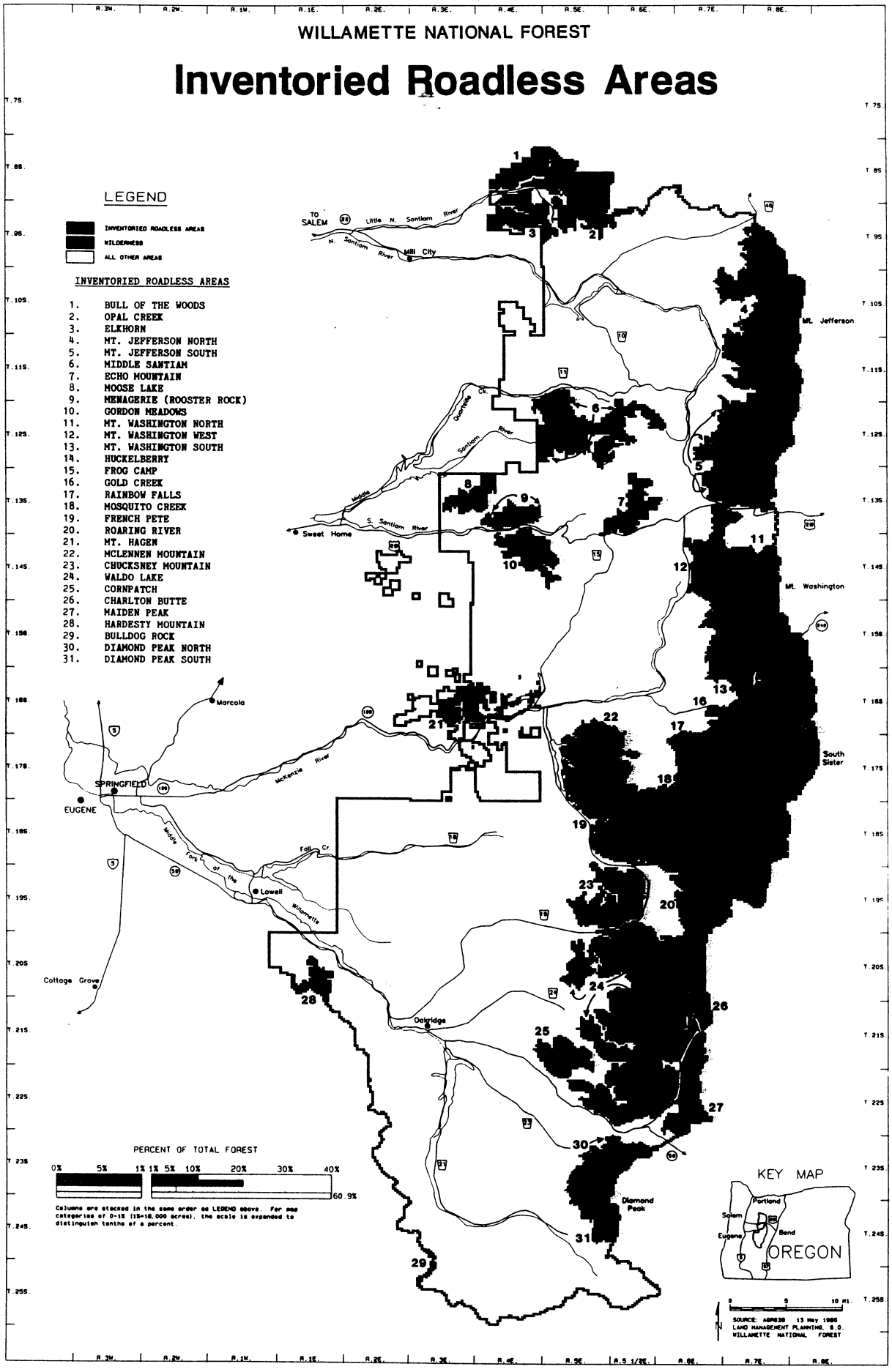
The Forest prior to release of the DEIS had 31 inventoried roadless areas which following passage of the Oregon Wilderness Act of 1984 totaled 210,207 acres. During the period 1984-1987 and the period following release of the DEIS (1987-1989), management activities were being implemented in many of these areas. A recent assessment of inventoried roadless area conditions indicates that 38,200 acres have been affected by management activities since the 1984 inventory was completed. The roadless area inventory currently includes 31 areas for a total of 172,007 acres. Figure III-Q-2 lists each roadless area by name; amount of area released for multiple-use management in 1984; amount of area affected since 1984; and remaining area in a roadless condition. A complete discussion of each area's attributes and resource potentials is provided in Appendix C. Areas identified in the roadless inventory are widely distributed throughout the Forest. Figure III-Q-3 illustrates the spatial distribution of areas.

Figure III-Q-2 Roadless Area Inventory

Roadless Inventory		Status of Inventoried Roadless Areas 1984-1989			
Areas listed below of less than 5,000 acres are either contiguous to designated Wilderness or roadless areas of adjacent National Forest.		Roadless area designated by Oregon Wilderness Act 1984[1]	Areas released for multiple use management by the Oregon Wilderness Act 1984	Acreages affected by Management Activities 1984-1989	Current size of inventoried roadless areas
Area Name	**Size**	**Acres**	**Acres**	**Acres**	**Acres**
Bull of the Woods	12,543	6,165	6,378	0	6,378
Opal Creek	12,585	1,301	11,284	597	10,687
Elkhorn	9,321	0	9,321	363	8,958
Mt. Jefferson North	16,871	7,187	9,684	3,648	6,036
Mt. Jefferson South	7,316	1,002	6,314	1,323	4,991
Middle Santiam	24,369	8,542	15,827	9,044	6,783
Echo Mountain	8,084	0	8,084	533	7,551
Moose Lake	5,674	0	5,674	896	4,778
Menagerie (Rooster Rock)	5,397	4,949	448	43	405
Gordon Meadows	9,556	0	9,556	1,195	8,361
Mt. Washington North	1,706	576	1,130	127	1,003
Mt. Washington West	9,726	0	9,726	3,050	6,676
Mt. Washington South	4,437	0	4,437	213	4,224
Huckleberry	853	0	853	0	853
Frog Camp	469	0	469	0	469
Gold Creek	1,301	0	1,301	256	1,045
Rainbow Falls	491	448	43	0	43
Mosquito Creek	491	0	491	85	406
French Pete [3]	2,730	0	2,730	149	2,581
Roaring River	2,410	0	2,410	362	2,048
Mt. Hagan [2]	6,292	0	6,292 [2]	0	6,292
McLennen Mountain	8,873	0	8,873	1,066	7,807
Chucksney Mountain	16,211	0	16,211	704	15,507
Waldo Lake [3]	89,591	44,734	44,857	12,968	31,889
Cornpatch	7,871	0	7,871	1,109	6,762
Charlton Butte	2,880	0	2,880	0	2,880
Maiden Peak	11,070	0	11,070	0	11,070
Hardesty Mountain	4,031	0	4,031	341	3,690
Bulldog Rock	555	0	555	0	555
Diamond Peak North	4,778	3,520	1,258	128	1,130
Diamond Peak South	597	448	149	0	149
Cowhorn [4]	6,058	6,058	0	0	0
Total Acreages	**295,137**	**84,930**	**210,207**	**38,200**	**172,007**

[1]Acreages are tentative until area boundaries are approved by Congressional Committee.
[2]This area was evaluated for the Wilderness option as well as other multiple uses; in the DEIS.
[3]This area is divided into several parts for purposes of description in Appendix C.
[4]Included in the Oregon Cascades Recreation Area as designated by the Oregon Wilderness Act of 1984.

Figure III-Q-3.



In addition to the Forest's Inventoried Roadless Areas, the Forest has also identified 24 unroaded land areas that range in size from 1,500 acres to 4,500 acres. These areas, too small for inclusion into the Forest's Roadless Area Inventory but large enough to provide semiprimitive dispersed recreation opportunities, are included in the Forest's Recreation Opportunity Spectrum (ROS) Inventory. The ROS Inventory is displayed in the Recreation section of this Chapter.

Under the provisions of the Oregon Wilderness Act of 1984, only one of the Forest's inventoried roadless areas has been evaluated for its suitability, availability, and need as potential Wilderness: Mt. Hagan. The Mt. Hagan roadless area, 6,292 acres, located near the community of Blue River, was neither reviewed in RARE or RARE II nor evaluated for the Wilderness option in a Forest Unit Planning process. In the DEIS the Mt. Hagan area was included in Alternative C as proposed Wilderness. The remaining roadless areas have been examined for their suitability to provide a full range of other multiple resource uses such as wildlife and fish habitat, scenery, recreation, research, wood products, and water in the DEIS Alternatives and the Alternatives included in this FEIS.

Public comment on the DEIS and Draft Forest Plan was highly polarized between the desire on one hand to maintain inventoried and other unroaded areas in an undeveloped state, and on the other hand a desire to enter and develop these areas in accord with "multiple use" objectives. Reasons stated for maintenance of roadless lands included: consideration for future Wilderness, ecological integrity, unroaded recreation, wildlife habitat, old growth preservation, and providing biological diversity. Respondents favoring development of roadless areas cite the Oregon Wilderness Act of 1984 as having settled the issue. This segment of the public feels that sufficient amounts of the Forest are currently dedicated to roadless area dependent uses.

Future Trends

It is anticipated that during implementation of the Forest Plan some roadless areas will become developed through road construction, mineral exploration, recreation facility construction and timber harvest; and others will remain in a roadless condition. The extent of development or preservation of roadless land is dependent upon the type of use to which areas are allocated in the Forest Plan and applicable management direction. However, if the Forest Plan favors development of roadless areas, the Forest's ability to satisfy future demand for uses dependent upon roadless conditions or evaluate areas for Wilderness in the next cycle of Forest Planning will be diminished. Conversely, if the preservation of roadless areas is favored then it is more likely that demand for uses dependent upon roadless conditions can be met and that more areas will qualify for Wilderness evaluation in the next cycle of Forest Planning (10-15 years).

The allocation of roadless areas to uses that do not permit development activities such as timber harvest, road construction, and mineral exploration have the potential to alter the economic base and social patterns of dependent communities. Allocation of roadless areas to uses that permit development activities on the other hand may result in changes to land form, vegetation, and size of individual areas. These changes typically alter an area's potential to provide isolation, solitude, and primitive recreation experiences, and hence their suitability for future Wilderness evaluation.

The extent of potential change to individual areas and the inventory as a whole is relative to the amount of roadless land either developed or maintained in an undeveloped state. The effect of allocation decisions of each alternative and their associated management activities on roadless areas is discussed in Chapter IV and in Appendix C.

SPECIAL INTEREST AREAS, OLD-GROWTH GROVES, AND NATIONAL NATURAL LANDMARKS

The Forest includes areas that exhibit unique ecological and biological communities, and geological characteristics. These lands are inventoried to identify their recreational and scientific values for the purpose of enjoyment and study. Special Interest Areas (SIAs) are designated to protect and where appropriate foster public use and enjoyment of areas with scenic, historical, geological, botanical, zoological, paleontological, or other special characteristics. Old-Growth Groves (OGGs) within the Forest have been identified for the purpose of protecting a unique component of the forest ecosystem. The principal values considered significant in managing OGGs are aesthetic, recreational, educational, biological diversity, wildlife habitat, and research. National Natural Landmarks (NNLs) are designed to preserve sites illustrating the geological and ecological character of the United States, enhance educational scientific value of preserved sites, and foster a greater concern for the conservation of the Nation's heritage.

Historic Trends

As resource management activities have extended into undeveloped areas, concern for the protection of unique and special Forest environments and features has been increasing. In general, public response to the issues of wildlife, plants and fish, dispersed recreation, developed recreation, visual resources, and cultural resources has focused on the concept of preserving areas of the Forest. Some responses have indicated the need to protect and preserve unique ecological and scenic values. Concern was expressed about the impact that developed recreation may have on sensitive habitats such as meadows, bogs, and lakes. Some responses stressed the need to preserve habitat which is suitable for Threatened and Endangered species and unique cultural resource areas.

This trend of concern for special areas is reflected by requests from the public to set aside specific landscape features as SIAs or OGGs. This trend has been supported by Forest proposals to establish more SIAs and OGGs. The value and importance of preserving unique and special aspects of our natural environment is emphasized by an expanded inventory of potential areas to be considered for designation by Forest managers. Five SIAs existed at the time of the 1977 Land Management Plan. The 1977 Plan proposed establishment of four new areas for a total of nine SIAs. Four of the five established SIAs in the 1977 Plan were reclassified as Wilderness when the French Pete area was added to the Three Sisters Wilderness by the Oregon Endangered Wilderness Act of 1978.

There has been a groundswell of public concern, both organizational and individual, for preserving for the benefit of present and future generations some of the most significant and representative stands of old growth. In 1976 the Forest Supervisor initiated an effort to identify and manage selected Forest OGGs, especially for their aesthetic and recreational values. Accessibility, stand and tree size, natural condition, and volume per acre were some of the criteria used in the selection. The 1977 Forest Land Management Plan listed 34 OGGs, 6 of which were later subsumed by the Wilderness Act of 1984.

Current Situation

The Forest currently contains one administratively established SIAs: the Lamb Butte Scenic Area located within the Blue River and McKenzie Ranger Districts. This area is mainly an open meadow with a variety of plant species; it provides summer range for Roosevelt Elk and black-tailed deer. Surrounding timber types are subalpine fir, true fir, and Douglas-fir. Taylor Castle, Lamb Butte, and English Mountain are three peaks of particular interest within this area of about 390 acres. Topography

is steep and elevation ranges from 4,800 to 5,600 feet. The area is managed to provide opportunities for high quality recreational experiences and to preserve its unique scenic resources.

The Forest also contains 49 potential SIAs. Of these, four areas were recommended for designation and are presently managed as SIAs under the current Forest Plan: Monument Peak Botanical Area, Tamolitch Valley Geological Area, Wolf Rock Geological Area, and Tumblebug Gorge Geological Area. Following release of the 1977 Forest Plan an establishment report was prepared for Monument Peak and the Moon Point area was identified as a potential SIA, however, Forest planning direction at the time reserved the establishment of any new SIAs until completion of new Forest Plans. These areas are included in Figure III-R-1; a complete listing of potential areas, their size, and classification type.

In addition to four proposed SIAs the current Forest Plan maintains 28 areas as designated OGGs. Ten additional OGGs have been identified and added to the inventory sine 1984, bringing the total number of OGGs to 38. Figure III-R-2 is a complete listing of inventoried potential OGGs.

The Forest contains no designated NNLs. There are currently, however, 21 potential NNLs within the Forest that have been identified by the National Park Service. These areas, in many instances, occur within the Forest's existing Wilderness or are coincidental with both established and potential SIAs, OGGs, Research Natural Areas, and the H.J. Andrews Experimental Forest. Figure III-R-3 is a complete listing of potential NNLs, their size and Forest location.

As shown by Figures III-R-1,2, and 3, numerous opportunities are available to establish SIAs and designate OGGs by the Forest Service and recommend establishment of NNLs by the Park Service. However, the choices among the potential SIAs is limited for potential zoological areas. This lack of representation of zoological areas for SIA designation could be compensated for through the establishment of Special Wildlife Habitat Areas. For a listing of potential Special Wildlife Habitat Areas refer to the Wildlife section in this Chapter.

Future Trends

Recreational use of designated SIAs and OGGs is likely to increase in the future. The fact of designating areas and identifying their locations serves to advertise availability and may inspire increased use. Actual use levels will, however, parallel those of general dispersed areas.

Unresolvable conflicts could occur between the various resource values protected within SIAs, OGGs, and NNLs. As an example, needed improvements to big game habitat may be incompatible within a Botanical Interest Area. In areas set aside for wildlife habitat purposes some management activities, such as burning, may conflict with recreational use or other values in specific locales for limited periods of time.

Certain types of developments within some potential NNLs or in SIAs or OGGs could result in disturbances to the specific values to be preserved, studied, or enjoyed.

Natural catastrophic events, such as fire, windthrow, and flooding could destroy the values protected within designated or potential SIAs, OGGs or NNLs . Management activities such as timber harvest and road construction could limit opportunities to maintain unique values if areas are recognized through protective designations. In addition, SIAs, OGGs, and NNLs could face the hazard of overuse by interested publics.

Table T035. Potential Special Interest Areas (SIAs) (III-R-1)

Potential SIAs[1]	Ranger District Location	Approximate Acres	Classification
Baby Rockshelter	Oakridge	107	Cultural
Bradley Lake	Rigdon	789	Botanical
Carpenter Mountain	Blue River	576	Geological
Chuckle Springs	Rigdon	107	Scenic
Clear Lake	McKenzie	512	Geological
Cloverpatch Butte	Lowell	576	Geological
Constitution Grove	Oakridge [2]	21	Scenic
Cougar Rock	Sweet Home	171	Cultural
Daly-Parrish Lakes	Sweet Home	405	Scenic
David Douglas	Oakridge	1,152	Geological
Deadhorse Rockshelter	Rigdon	42	Cultural
Doe Mountain	Sweet Home	149	Cultural
Eagle Creek	Oakridge	469	Scenic
Fish Lake	McKenzie	277	Cultural
Gold Hill	Sweet Home	1,536	Cultural
Hardesty Mt.	Lowell	3,178	Ecological
Hell Hole	Oakridge	85	Geological
Hidden/Lulu Lakes	Blue River	597	Botanical
Hills Creek	Detroit	256	Zoological
Horsepasture Cave	Rigdon	21	Cultural
Indigo Springs	Rigdon	21	Cultural
Iron Mt/Cone Peak	Sweet Home	2432	Botanical
Fall Creek	Lowell	2794	Recreational
Long Ranch	Sweet Home	43	Zoological
McKenzie River	McKenzie/Blue River	1,984	Recreational
Monument Peak[3] [4]	Detroit	384	Botanical
Moon Point [5]	Rigdon	2,005	Botanical
OCM Wagon Road	Rigdon	2,560	Cultural
Opal Creek	Detroit	277	Scenic
Pepper Rockshelter	Oakridge	21	Cultural
Phantom Natural Bridge	Detroit	128	Geology
Pinnacle Peak	Detroit	235	Geological
Rider Swamp	Blue River	21	Botanical
Rigdon Meadows	Rigdon	107	Cultural
Riggs-Don Lakes	Sweet Home	192	Scenic
Roaring River Spgs	Blue River	256	Geological
Salt/Diamond Cyn.	Oakridge	597	Scenic
Sand Mountain	McKenzie	363	Geological
Santiam Wagon Road	Sweet Home/McKenzie	3,263	Cultural
Shelter Falls	Sweet Home	64	Geological

Table T035 Cont. Potential Special Interest Areas (SIAs) (III-R-1)

Potential SIAs[1]	Ranger District Location	Approximate Acres	Classification
S.Fork McKenzie	Blue River	3,263	Recreational
Sweetwater Springs	McKenzie	128	Botanical
Tamolitch Valley[3]	McKenzie	1,813	Geological
Terwilliger Hot Springs	Blue River	149	Geological
Three Pyramids	Sweet Home	1,877	Botanical
Tumblebug Gorge[3]	Rigdon	427	Geological
Vine Rockshelter	Rigdon	21	Cultural
White Cliffs Cave	Oakridge	21	Cultural
Wolf Rock/Lake[3]	Blue River	597	Geological/Botanical
TOTALS 49 Areas		36,960	--

[1]Descriptions of individual areas are included in the planning record.
[2]Included within the NF MF Willamette River Wild and Scenic River corridor.
[3]Areas recommended for establishment in the 1977 Land Management Plan.
[4]Establishment Report--Monument Peak SIAs, March 24,1981.
[5]Moon Point Environmental Assessment--Interim Management Plan, March 16,1982.

Table T---. Potential Old-Growth Groves (OGGs) (III-R-2)

Old-Growth Grove	District	Dominant Species	Significant Attribute	Acres
Big Swamp	Rigdon	Douglas fir/w.redcedar	Tree diameter	192
Camp Creek [2]	Sweet Home	Noble fir	Tree diameter	363
Castle Rock	McKenzie	Douglas fir	Accessibility	43
Cayuse Creek	Oakridge	Douglas fir/true fir	Tree diameter	43
Cliff's Creek	Detroit	Douglas fir/w.hemlock	Accessibility	107
Delta	Blue River	Douglas fir/true fir	Accessibility	277
Echo Basin	Sweet Home	Alaska yellow cedar	Outstanding example	256
Elk Camp	Oakridge	Douglas fir, Pacific silver fir	Outstanding example	128
Fall Creek	Lowell	Douglas fir	Tree diameter	85
Fisher Creek	Oakridge	Douglas fir	Tree diameter	85
Fish Lake Creek	McKenzie	Douglas fir	Stand Density	43
Gold Lake	Oakridge	Douglas fir/Mtn.hemlock	Outstanding example	469
Goodman/Sawtooth	Lowell	Douglas fir	Tree diameter	43
Hackleman Creek	Sweet Home	Douglas fir/W.white pine	Accessibility	21
Highway 20	McKenzie	Douglas fir	Stand Density	85
Hugging Tree [2]	Lowell	Douglas fir	Tree diameter	21
Indian Creek	Sweet Home	Douglas fir/w.white pine	Outstanding example	43
Johnny Creek	Lowell	Douglas fir	Stand Density	43
Kelsey Creek [2]	Oakridge	Douglas fir	Tree diameter/age	192
Little Fall Creek I [2]	Lowell	Douglas fir	Tree diameter/ht.	107
Little Fall Creek II [2]	Lowell	Douglas fir	Tree diameter/ht.	93
Lost Creek	McKenzie	Douglas fir/w.redcedar	Accessibility	192
McKenzie	Blue River	Douglas fir	Accessibility	43
Outerson Mountain	Detroit	Alaska yellow cedar/w.hemlock	Outstanding example	384
Pyramid [2]	Sweet Home	Douglas fir	Accessibility	448
Sardine Butte	Oakridge	Douglas fir	Tree diameter/age	64
Scar Creek [2]	Sweet Home	Douglas fir/T.fir/w.red cedar	Outstanding example	85
Scar Mountain [2]	Sweet Home	True fir	Park-like stand	192
Seven Mile	Sweet Home	Douglas fir	Outstanding example	85

Table III-R-2. Potential Old-Growth Groves (OGGs)

Old-Growth Grove	District	Dominant Species	Significant Attribute	Acres
Slick Creek/Bedrock	Lowell	Douglas fir	Stand Density	43
South Fork Breitenbush	Detroit	Douglas fir/w.hemlock	Accessibility	384
Three Creeks [2]	Sweet	Douglas fir	Tree diameter/age	1792
Tumble Creek	Detroit	Alaska y.cedar/Douglas fir	Outstanding example	576
Upper Furnish Creek	Oakridge	Douglas fir/Pacific s.fir	Stand diversity	128
Upper Salmon Creek	Oakridge	Noble fir	Park-like stand	64
Wall Creek	Oakridge	Douglas fir/w.redcedar	Accessibility	107
Whitewater Bend	Detroit	Douglas fir/w.hemlock	Accessibility	85
TOTALS	38 Areas	--	--	7,496

[1]Descriptions of individual areas are included in the planning record.
[2]Inventory additions since 1984.

Table T036. Potential National Natural Landmarks (NNLs) [1] (III-R-3)

Potential NNLs/Vicinity	Ranger District	Approx. Acres WNF	National Forest[3]
Belknap Crater/Mt. Washington Wilderness	McKenzie	2,346	Willamette/DNF
Clear Lake/Clear Lake	McKenzie	107	Willamette
Exper.Watershed No.2/H.J. Andrews Exper.Forest	Blue River	171	Willamette
Gold Lake Bog RNA/Gold Lake	Oakridge	469	Willamette
Iron Mountain/Cone Peak/Highway 22	Sweet Home	6,719	Willamette
Jefferson Park/Mt. Jefferson Wilderness	Detroit	896	Willamette
Lamb Butte/Lamb Butte Scenic Area	McKenzie	405	Willamette
Lowder Mountain/Three Sisters Wilderness	Blue River	149	Willamette
Mack Creek/H.J. Andrews Exper.Forest	Blue River	1,557	Willamette
McKenzie Summit/Highway 242	McKenzie	192	Willamette/DNF
Middle Santiam/Middle Santiam Wilderness	Sweet Home	1,152	Willamette
Hagan Block RNA/Mt. Hagan	Blue River	853	Willamette
Mt. Washington/Mt. Washington Wilderness	McKenzie	256	Willamette/DNF
Ollalie RNA/Ollalie Ridge	McKenzie	724	Willamette
Quaking Aspen Swamp/Three Sisters Wilderness	Blue River	235	Willamette
Rock Mesa/Three Sisters Wilderness	McKenzie	811	Willamette/DNF
Three Fingered Jack/Mt. Jefferson Wilderness	Detroit	939	Willamette/DNF
Three Sisters/Three Sisters Wilderness	McKenzie	11,902	Willamette/DNF
Torrey-Charlton RNA/Charlton Butte	Oakridge	2,154	Willamette/DNF
Waldo Lake/Waldo Lake	Oakridge	6,612	Willamette
Wildcat Mountain RNA/Wildcat Mountain	Sweet Home/ McKenzie	1,003	Willamette
TOTAL	21 Areas	39,652	--

[1]Source: USDI Park Service.
[2]Willamette National Forest Acreage.
[3]DNF = Deschutes National Forest.

RESEARCH NATURAL AREAS AND H.J. ANDREWS EXPERIMENTAL FOREST

The National Forest Management Act (NFMA) of 1976 called for Forest planning to establish a nationwide system of Research Natural Areas (RNAs). Research Natural Areas are biotic preserves which serve as ecological reference points, or as experimental controls, against which it is possible to measure and assess the results of Forest management activities. They also serve as field laboratories to monitor natural processes and storehouses of genetic diversity.

The role of RNAs is limited to research, study, observations, monitoring, and educational activities that are nondestructive and nonmanipulative, and that maintain unmodified conditions. Research Natural Areas can be used to preserve a wide spectrum of numerous natural situations. These comparatively small sized areas provide the following functions:

- Preserve and maintain genetic diversity.
- Protect against serious environmental disruptions.
- Provide educational and research areas for ecological and environmental studies.
- Monitor environmental and hydrological conditions as baseline information for determining effects of land management practices on terrestrial and aquatic systems.
- Serve as baseline areas or controls for research measuring ecological and hydrological effects of land management manipulation techniques and practices.
- Preserve gene pools for typical and threatened and endangered plants and animals.

The H.J. Andrews Experimental Forest was dedicated for development of better methods for managing forested lands in the Western Cascades and to determine the effects of timber management activities on soils, fish, wildlife, and water quality and quantity. Timber is harvested to meet the specific needs of research on an irregular basis. Harvesting may include a full range of silvicultural practices and harvesting methods.

Historic Trends

Early research on the Forest began around 1910 by Thornton T. Munger. Mungar initiated a series of Region-wide sample plots in second growth Douglas-fir, the first in a 50-year-old stand near Oakridge. Between 1910 and 1914 a number of expiermental plantations were established to test the adaptability of eastern hardwoods in various areas of the Forest. Under the direction of Julius Kummel several areas; 3.25-acre tracts behind the McKenzie Bridge Ranger Station, a tract near West Boundary Ranger Station, and some strips near Dead Mountain were planted. According to research records these "apparently were all failures." A number of large plantations were also set up, mainly in old burns, including the Battle Ax tract on the border of the Mt. Hood and Santiam National Forests in 1913-1915; Breitenbush tract, near the springs in 1915; Dead Mountain, 1915-1917; and Seven Mile Hill in the same period. Trees planted in these tracts with the aid of forestry students from Oregon State University were Douglas-fir, western white pine, and with some tracts of noble fir.

These early research efforts were later followed by the formal designation of Forest lands for research purposes. The establishment of Research Natural Areas (RNAs) and Experimental Forests has been

increasing since the McSweeny-McNary Act of 1928. The H.J. Andrews was established 20 years subsequent to this Act, and between 1965 and 1979, four RNAs were created. The number of research projects undertaken each year in established areas has also increased.

The Experimental Forest is representative of mid- and upper-elevation forests on steep slopes with extensive areas of unstable land. It was established for the study of forest and watershed management problems associated with conversion of old growth Douglas-fir and upper-slope mountain hemlock and noble fir to young managed stands. In the beginning, most studies were about methods of cutting timber and building roads.

Over the years, use of the Experimental Forest has gradually shifted and expanded. In the 1960s, research attention focused on the effects of forest practices on water quality and quantity. Beginning in 1969, basic research on ecological and environmental phenomena was intensified, and use by university scientists increased. From 1969 through 1978, the Experimental Forest served as an intensive study site of the Coniferous Forest Biome Project of the International Biological Program. In 1974, it became part of an international system of Biosphere Reserves designated by the United Nations Education, Cultural, and Scientific Organization. The primary objectives of these reserves was conservation of genetic diversity, environmental research and monitoring, and education.

The H.J. Andrews Experimental Forest increases in value as a research site as data about various processes of ecosystem functioning accumulate from old and new long-term studies. One reason it is uniquely suited to ecosystem studies is that scientists of many disciplines are working side-by-side, sharing data, looking at the same processes and products from different viewpoints, and making use of the many years of record. Some records date almost to 1948 when the Experimental Forest was established. Indirect records (i.e., tree rings) provide information that goes back about 850 years in some areas. Precipitation has been measured since 1951 and temperature and humidity since 1957. Three experimental watersheds were established in 1952 and a plant collection was begun in 1958.

In 1977, the Experimental Forest was selected as the Nation's first Experimental Ecological Reserve supported by the National Science Foundation. In 1980, it became a charter member of the National Science Foundation's Long-Term Ecological Research network of research sites. The network now totals 15 sites and includes many of the major ecosystem research sites and groups in the nation. The list of publications stemming from work done at the *H.J. Andrews Experimental Forest since 1948* contains almost 600 reports, papers, and abstracts that address the the consequences of various management actions related to silviculture, soils, hydrology, wildlife, geology, ecology and fire.

Current Situation

The Forest currently administers one Experimental Forest and four established Research Natural Areas. There are no proposed additional nor anticipated Experimental Forests in the Forest. Five areas have been identified as potential RNAs. In addition the Wildcat Mt. RNA is proposed to be enlarged by 384 acres. Figure III-S-1 displays information about the established Research Natural Areas.

Table T037. Established Research Natural Areas (III-S-1)

Area	Acres	District	Established Date
Gold Lake Bog RNA	463	Oakridge	1965
Olallie Ridge RNA	720	McKenzie	1963
Middle Santiam RNA [1]	1,145	Sweet Home	1979
Wildcat Mountain RNA	1,000	Sweet Home	1968
TOTAL ACRES	3,328	--	--

[1]Within the Middle Santiam Wilderness.

The four Research Natural Areas (RNAs) established in the Forest as representative "cells" (i.e., a basic unit such as an ecosystem, vegetative community, or habitat) are listed by the Pacific Northwest Research Natural Area Committee as component parts of the overall coniferous forest ecosystem of the Northwest. Each of these established areas is briefly described below.

Olallie Ridge RNA: Established in 1963 to represent mountain meadow and true fir-mountain hemlock communities prevalent on high ridges in the Western Cascades of Oregon. The area provides unusual opportunities for studying subalpine meadow-forest mosaics. Many subalpine meadows are becoming increasingly impacted by recreation use. Research on an unimpacted area should help with planning management regarding use problems. The RNA is also an important refugium for disjunct populations of numerous plant species. Research in this area includes studies of distunct flora, distribution and role of fungi on conifer needles, and habitat classification.

Gold Lake Bog RNA: Established in 1965 to preserve some prime subalpine bogs. It provides for the protection of six uncommon species of bog plants. The surrounding forest land creates opportunities for studying the variation in composition, structure, and productivity of forest communities along an environmental gradient from wet, low-lying to dry, upland areas. Research in this area includes studies of the bog communities and their flora.

Wildcat Mountain RNA: Established in 1968 to preserve prime examples of the noble fir stands found on mountain ridges in the Western Cascades of Oregon. This area provides numerous opportunities for studying the various management concerns related to noble fir (i.e., cone production, amount and quality of annual seedfall, soils, growth and yield of stands, and causes of mortality). Other studies on the RNA include distribution of birds and mammals in relation to plant communities, relation of site index to habitat types in the Pacific silver fir zone and ecological monitoring of long-term effects of energy development.

Middle Santiam RNA: Established on May 23, 1979, is now within the boundaries of the Middle Santiam Wilderness Area which was designated by Congress in 1984. The area includes representative stands

of old-growth (450+ years), Douglas-fir/western hemlock forests of the Western Oregon Cascades, and three drainage tributaries to the Middle Santiam River. Studies taking place on the Middle Santiam have included: productivity of old-growth forests; composition and successional development of forest communities as related to environmental factors such as soil, aspect and topographic position; role of coarse woody debris in stream stabilization and sediment routing; and research on old growth as wildlife habitat.

Of the potential RNAs, Hagan Block and Torrey-Charlton were proposed in the Forest's 1977 Multiple Use Land Management and Timber Management Plan. Establishment reports for these areas are generally complete. There is a proposal to add about 425 acres to the Hagan Block area to complete some ecological systems, for a total of 1,280 acres. The Rigdon Point area is a specific cell listed for the knobcone pine species but does not represent the specific plant community (i.e., SAF timber Type 248). The Mckenzie Pass potential RNA is a subalpine lava flow with representative vegetation. This ecosystem is well protected by the surrounding Wilderness. The ecotone between the younger unvegetated lava flows and the older vegetated flows that surround the area should provide good opportunities for successional studies. The Three Creeks area is a stand of old-growth timber including trees exceeding 700 years in age. The proposed expansion of the Wildcat Mt. RNA includes two parcels totaling 384 acres along the northern edge of the area. Figure III-S-2 includes information relating to each of the potential RNAs.

Table T038. Potential Research Natural Areas (III-S-2)

Area Name	District	Acres
Mt. Hagan	Blue River	1,280
Torrey-Charlton [1]	Oakridge	2,154
Rigdon Point	Rigdon	300
McKenzie Pass [2]	McKenzie	1,195
Three Creeks	Sweet Home	661
Wildcat Mt. Addition	Sweet Home	384
TOTAL ACRES		5,987

[1]Partially within the Waldo Wilderness.
[2]Partially within the Three Sisters Wilderness.

The H.J. Andrews Experimental Forest (HJA) was established on the Blue River Ranger District in 1948 as a site for research and education on the ecology and management of coniferous forests and watersheds in the Douglas-fir region by the Pacific Northwest Forest and Range Experiment Station. Through a use agreement, Oregon State University in recent years has used the HJA extensively in teaching programs and for student research projects. Management of the Experimental Forest is a joint effort of the Pacific Northwest Forest and Range Experiment Station and the Forest.

The HJA is a 15,700 acre area that includes the entire Lookout Creek drainage north of the town of Blue River. It has steep, densely forested slopes ranging from 1,500 to 5,000 feet in elevation. Rich forest soils produce high quality/quantity Douglas-fir with minor amounts of Pacific silver fir, noble fir, western hemlock, western redcedar, and a few pine species.

Roads have been constructed to harvest timber and are maintained periodically to protect resources and provide safe travel routes. There are no developed recreational facilities within the HJA but many

forms of dispersed recreation may be enjoyed throughout the drainage, except where restrictions are posted.

Future Trends

With the increasing demand for the various uses of forest land (both public and private) including the utilization of renewable resources, more knowledge is necessary to protect and keep these lands productive. This has been specifically recognized by Congress (see McSweeny-McNary Act, May 22, 1928; and the McIntire-Stennis Act, October 10, 1962). It is evident that the importance of the existing and proposed research and experimental areas will continue to grow locally, nationally and worldwide.

The demand for Experimental Forests and Research Natural Areas is derived from the kinds of management problems that are experienced daily and the kind of habitats that are encountered. Areas of land have been selected and/or proposed which contribute to the maintenance of biodiversity, and are representative of cells (habitats, communities, organisms, etc.) deemed important elements in the Pacific Northwest coniferous biome.

The current demand is established through management needs for managing Forest lands and renewable resources. An additional demand is expressed through the need to protect the cells listed before they have been changed ecologically by Forest management activities.

Climatic, geologic, and biologic systems are dynamic. Thus research involving these systems will be expanding and becoming more intensive as land uses and resource utilization intensify.

Minor changes in conditions are expected, over and above those inherent in the management of RNAs or the HJA. All areas are subject to change resulting from natural events such as wind, fire, insect, and disease. Olallie Ridge and Gold Lake Bog RNAs are popular sites for the "recreation botanist" and other amateur biologists. University students also make use of the areas for study and research. As a group, these uses tend to alter existing conditions of the more unique plant habitats. Extensive timber harvesting on the perimeter of these areas has the potential to reduce the effective size of some of the included habitats (cells). In the case of RNAs, the establishment report sets forth an area objective of maintaining the ecosystems within the boundaries in a natural state of succession. Where necessary, the management of adjacent lands is expected to be modified to protect these values and the integrity of the RNA. The Torrey-Charlton proposed RNA surrounds several fishing lakes. Existing recreation use of this area will be recognized in the establishment report and research plans, however, recreation use is not an objective of Research Natural Areas.

The research and activity interactions within the H.J. Andrews Experimental Forest include those of RNAs, as well as vegetation, landform, wildlife habitat, soil, and water alterations. Conditions resulting from these alterations are due to timber harvest and road building activities and are induced for the purpose of study and research.

RANGE

The heavily forested Forest has limited capacity for grazing of domestic livestock. There has been some use of the suitable areas for grazing cattle and sheep under fee permits and some free-use grazing of recreational stock.

Historic Trends

Permitted livestock grazing presently occurs on several scattered areas in the Forest, although domestic livestock grazing on the Forest has declined significantly over the years. In 1934, there were about 848 Animal Unit Months (AUMs) of permitted grazing by cows and 19,260 AUMs by sheep. An Animal Unit Month is equal to one 1,000-pound animal feeding for 30.5 days. However, by the mid-40s permit use had already started to decline and by 1951 there were no sheep grazing permits and only about 797 AUMs of permitted cow and horse use. (Forest Service file 2230.)

There were 398 AUMs permitted on two cattle allotments under a term permit in 1984, and free-use grazing permits on 15 recreation grazing allotments which reported 190 AUMs. There is also potential for livestock use in the form of transitory range.

The decrease in range use on the Forest can be attributed to several factors. Grazing for some permittees became less economically efficient due to the increased cost in labor and the transportation of livestock without similar increases in livestock values, and the higher cost associated with maintaining permits due to increased needs to protect the soil and water resources. The amount of available range has declined over the years due in part to Wilderness establishment. In new Wilderness, allotments were not available to new permittees. The amount and location of grazing permitted on the Forest has also been limited by other factors including the protection of water quality, sensitive plants, and unique habitats.

Livestock have considerable dietary overlap with elk; they often consume or damage forage that elk would otherwise eat. This competition for forage is especially significant in winter range which big-game need to compensate for a condition of low energy reserves.

In addition to forage competition with big game, livestock host diseases that may be detrimental to native species. Studies conducted on the Forest in the late 1970s suggested that domestic sheep hosted diseases that infected black tail deer. As more sheep were placed on the allotment, there was an increased incidence of several parasites within the overlapping deer population. (Forest Service files 2600.) Where range use between sheep and black tail deer overlap, these diseases can be a greater problem for deer than forage competition.

Predation by bear, coyote, and cougar on permitted livestock was suspected during the 1940s and 1950s. The conflict between native wildlife species and domestic livestock meant, in some instances, that the predators were destroyed. This is an adverse effect on wildlife and makes fewer animals available for viewing by the recreational user.

Current Situation

Livestock grazing has contributed to localized decreases in water quality due to defecation and streambank instability caused by trampling. Livestock have also, in localized areas, contributed to soil compaction which can change the soil structure, affect water absorption and holding capacity resulting in reduced plant growth. Compaction is minimized by ensuring that grazing lands are relatively dry

before grazing occurs. However, naturally moist meadows receive some damage regardless of when they are grazed.

Taking into consideration potential forage produced on harvested acres throughout the Forest (transitory range), the plant forage potential on the Forest is underutilized.

The narrow profit margin for both range cattle and sheep operations have made the use of the grazing opportunities on the Forest less desirable to potential permittees.

Future Trends

Future use of cattle and sheep grazing opportunities is difficult to predict. However, given current market conditions, there will be no significant changes in livestock grazing use on the Forest in the foreseeable future. Expected increases in future recreation use will probably result in more recreation stock utilizing forage on the Forest.

FACILITIES

Facilities on the Forest include Forest Service administrative sites and structures, special use structures, and utility corridors. Administrative sites serve a variety of purposes related to the administration and management of the National Forest. Utility corridors provide the land area needed for transmission facilities for basic utilities, such as electricity, telephone, and water lines. Special use structures are facilities developed and operated under special use permit to serve the specific purpose of the operator. These uses are widely varied; their role is to provide permittees with the opportunity to use Forest land as a base for activities or operations which are compatible with the environment and management of the other resources.

The use of these permits may impact several components of the environment including vegetation, water, soil, scenery, and wildlife. The USDA Forest Service provides for the continued existence and use of the present long-term high capital investment special use permits. However, if a permit is found to be in violation of legal requirements or minimum standards of other resources values, compliance is sought to remedy the violation. The authorized officer may revoke, suspend, terminate, or renegotiate terms of the permit.

Historic Trends

In the past two decades, construction of buildings has not kept up with needs for space, particularly office space. While positions were added to deal with more intensified resource concerns, construction of offices and related service buildings was reduced. Even after recent staff reductions and some new construction, the Forest has some overcrowded working conditions in outdated offices and temporary facilities.

Current Situation

Administrative Sites

The headquarters of the Forest is the Supervisor's Office located in Eugene. The Forest is subdivided into seven Ranger Districts with offices in Oakridge, Westfir, Lowell, Blue River, McKenzie Bridge, Sweet Home, and Detroit. Administrative sites located on National Forest System land include one work center, two seed orchards, and a variety of offices, residence bunkhouses, workhouses, tree coolers, shops, and other project related buildings.

The Forest has 8 buildings that were constructed for office space; 5 were built in the 1950s and 3 were built in the 1960s. There are also 4 leased office buildings, several converted garages and houses, and approximately 16 modular units being used for office space.

Currently 45 residences are available for employee use on the Forest. They are of varying ages, having been constructed in the following decades: 2 in the 1920s, 9 in the 1930s, 28 in the 1950s, 4 in the 1960s, and 1 in the 1970s.

A total of 14 permanent buildings have been constructed to provide warehouse and equipment storage space. They were built as follows: 1 in the 1920s, 5 in the 1930s, 5 in the 1950s, 2 in the 1960s, and 1 in the 1980s. Other buildings of various purposes exist at each site. Generally, their age classification is similar to those described above.

The Forest has one heliport under its jurisdiction at the Detroit Work Center. The Oakridge and McKenzie airports are also used as heliports. These heliports are used for fire and administrative activities.

Others

Various other facilities are found on the Forest including:

- A powerplant for the city of Eugene.
- Access roads and assorted facilities for the Southern Pacific Railroad.
- Electronic sites at 15 locations throughout the Forest.
- Facilities for the Bonneville Power Administration, Portland General Electric, and Eugene Water and Electric Board.
- A camp and picnic area operated by the Oregon State Parks and Recreation Division.
- Winter sports sites at Willamette Pass and Hoodoo Ski Bowl.
- A total of 248 recreation residences situated on 85 acres of the Forest.
- 21 small-scale hydroelectric projects in various stages of development, (only one project, Falls Creek, is on line).

Permits that alter the vegetation include utility corridors, ski areas, transportation corridors, and recreation residences. It is necessary to limit height of vegetation with in the corridors and ski area so the vegetation does not interfere with the use. Forage habitat with long linear edges is available for wildlife. Transportation corridors may add edge effect, but the noise and congestion of traffic also affects travel routes.

Hoodoo Ski Bowl is located one mile south of U.S. Highway 20 on the Santiam Pass. Facilities located on the 644 acre area includes three chair lifts, two rope tows, two day-lodges, and utility buildings and other facilities. The ski runs are essentially located on the east and northeast slopes of Hoodoo Butte.

Willamette Pass Ski Area is located at the crest of the Cascade Mountains on State Highway 58. This 1,100 acre facility will be implementing an expansion plan during this planning period. After expansion is completed the area will include six chair lifts, two day lodges, ski patrol building, parking overpass, utility buildings and other facilities. Environmental documents can be found at the Forest headquarters in Eugene.

Water quality has been affected by recreation residence use. This has been attributed to old systems of sewage disposal and illegal installations. Soils near these residences are generally not conducive to adequately filtering or storing waste.

Potential transmission corridors have been identified throughout the Western United States by the utility industry. These are displayed in the Western Utility Group's "Western Regional Corridor Study" of 1986. The Study identifies potential (and existing) utility transmission corridors across the crest of the Cascade Mountains at Willamette Pass (State Highway 58), at McKenzie Pass (State Highway 242), and down the North Fork of the Breitenbush River.

Future Trends

Monitoring of special uses will continue to avoid or remedy violations of legal requirements or violation of minimum standards of other resource values.

ROADS

Access into and through the Forest is provided by more than 200 miles of county, state, and federal highways. To facilitate protection, management, and use of the Forest, approximately 6,500 miles of permanent Forest roads have been constructed and are being maintained at various use levels. Forest roads originally were built, primarily, to access timber harvest units and for other administration purposes. Today roads also provide the primary access to lakes, trails, picnic and campgrounds, and the trailheads for hiking into the beautiful backcountry of our Wildernesses. They continue to facilitate resource management and wildfire suppression.

Historic Trends

The first roads on the Willamette were pioneer wagon roads. Some of these historic routes are now major roads and highways. The Santiam Wagon Road is one example; it carried the first auto over the Santiam Pass in 1902, and continues to carry auto and truck traffic today. Since the 1940s the majority of road construction and reconstruction has been in support of timber management activities. Recreation use has an increasing effect on the operation, maintenance, and management of the Forest road system. Historically, motor vehicle access by the public was allowed and encouraged throughout the entire system. This level of access resulted in high road costs.

Road management practices became more cost-effective during the early 1980s. Multiple-use opportunities and resource outputs can be provided without constructing and maintaining every road for every use. Many of the minor local roads are now maintained only for high clearance vehicles or allowed to close naturally, maintaining only the drainage system to avoid washouts.

Current Situation

The transportation system objectives are to plan, develop, and operate a network of roads that provide user safety, convenience, and efficiency of operations to accomplish the land and resource management objectives of the Forest.

Roads are classified as either arterials, collectors, or local roads. Arterial roads are primary roads, quite often double lane and paved, that provide the main access into and out of the Forest. Local roads serve as terminal roads or "work" roads that access the smaller work areas. Collectors are the roads that connect local and arterial roads. Collectors may be double lane roads but normally are single lane. Some collector roads are paved but most are rock aggregate surfaced. Figure III-V-1 lists the existing road system by functional classification, including roads under contract to be constructed by the end of fiscal year 1986.

The Forest has defined the traffic service level for each road. The traffic service levels describe the traffic and operational characteristics for which the road is managed. Figure III-V-2 shows traffic service levels for existing arterial and collector roads.

The current trend is to reduce costs of development, operation, and maintenance. Roads are now being developed, operated and maintained to serve only objectives identified during project planning. This results in reduced road clearing, road width, surfacing requirements and varied management techniques than required to accommodate the low clearance passenger car. In addition, roads serving small geographic areas, single project activities, or limited in use by weather and design features are being closed to prevent resource damage and reduce costs. Approximately 24% of the existing road system is suitable for use by low clearance vehicles. (See Figure III-V-3.)

Figure III-V-1. Existing Road System

Classification	Miles
Arterial	232
Collector	1,815
Local	4,480
Total Miles	6,527

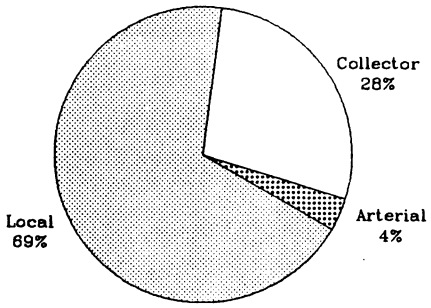
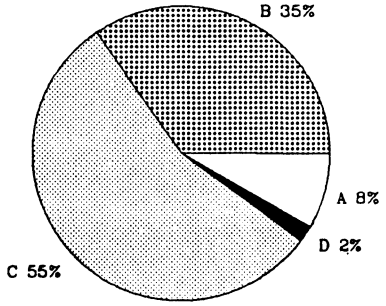


Figure III-V-2. Existing Arterial and Collector System [1]

Level	Miles
A	168
B	710
C	1,132
D	37
Total	6,527



[1] Traffic service levels are defined as:

- A - Free flowing traffic with adequate passing facilities and smooth surface.
- B - Congested during heavy traffic such as peak logging or activities. Surface is stable for the normal use season and smoothness is commensurate with the design speed.
- C - Traffic interrupted by limited passing facilities or slowed by the road condition. Surface may not be stable under all traffic or weather conditions during the normal use season.
- D - Flow is slow or may be blocked by an activity. Two-way is difficult and may require backing to pass. Rough, irregular surface is stable during dry conditions.

Table III-V-3. Existing Road System by Maintenance Level

	Operational Maintenance Level [1]					
Forest	1	2	3	4	5	Total
TOTAL	804	4,188	1,101	149	285	6,527

[1]Those roads in Level 1 (16%) maintenance are managed in a storage category and are closed for resource or safety reasons or are allowed to close naturally--being open for use until that happens. Those in Level 2 (60%) are kept open for high clearance vehicles, (pickups) but they are allowed to "brush in" and become much more natural until the next commercial use. The roads maintained in Level 3 and above (24%) are maintained suitable for use by low clearance vehicles (cars), those in the higher levels providing more comfort.

On the Forest the demand for roads is a function of the demand for recreation and timber. The amount of new construction depends mainly upon the need for access to timber sale areas. Some new road construction will occur for recreation purposes, (i.e., access to new campgrounds), depending upon the need for additional recreation facilities. The mileages of road construction and reconstruction are shown in Figure III-V-4.

The Forest manages traffic and roads for long-term, seasonal, and project purposes to support resource management objectives. Closed roads may exclude a variety of user groups or may provide access to a single user when imposed for one or more of the reasons listed below:

1. Wildlife--Closures may be used to protect and enhance high potential elk management areas, spotted owl habitat, and nest sites of Osprey and Bald Eagles. Road closures are also used to provide quality hunting areas. Some wildlife closures are open to vehicles during seasons of the year when disturbance of the wildlife has a lesser impact. The Forest cooperates with the Oregon Department of Fish and Wildlife in this effort.

2. Water quality and erosion control--Roads can be closed to prevent rutting and surface disturbance, and to reduce erosion and sediment entry into streams.

3. Public safety--Damaged roads or structures, wildfires, or activities dangerous to visitors require closure to certain users. Closure may also be required during certain activities including search and rescue operations.

4. Conflict of use--In a few cases, usually for user safety, it is necessary to give preference to one user over another. Examples are log hauling on a narrow road with few turnouts, or compliance with share cost agreements.

5. Maintenance cost reduction--The cost of maintaining the road system can be reduced by closure.

6. Legal mandates--Some areas, such as Wilderness, are afforded protection by Federal law from the use of motorized vehicles (36 CFR 261.16, 261.19, and 293.17 USC 551) without proper authority. Closures of this type are signed and enforced.

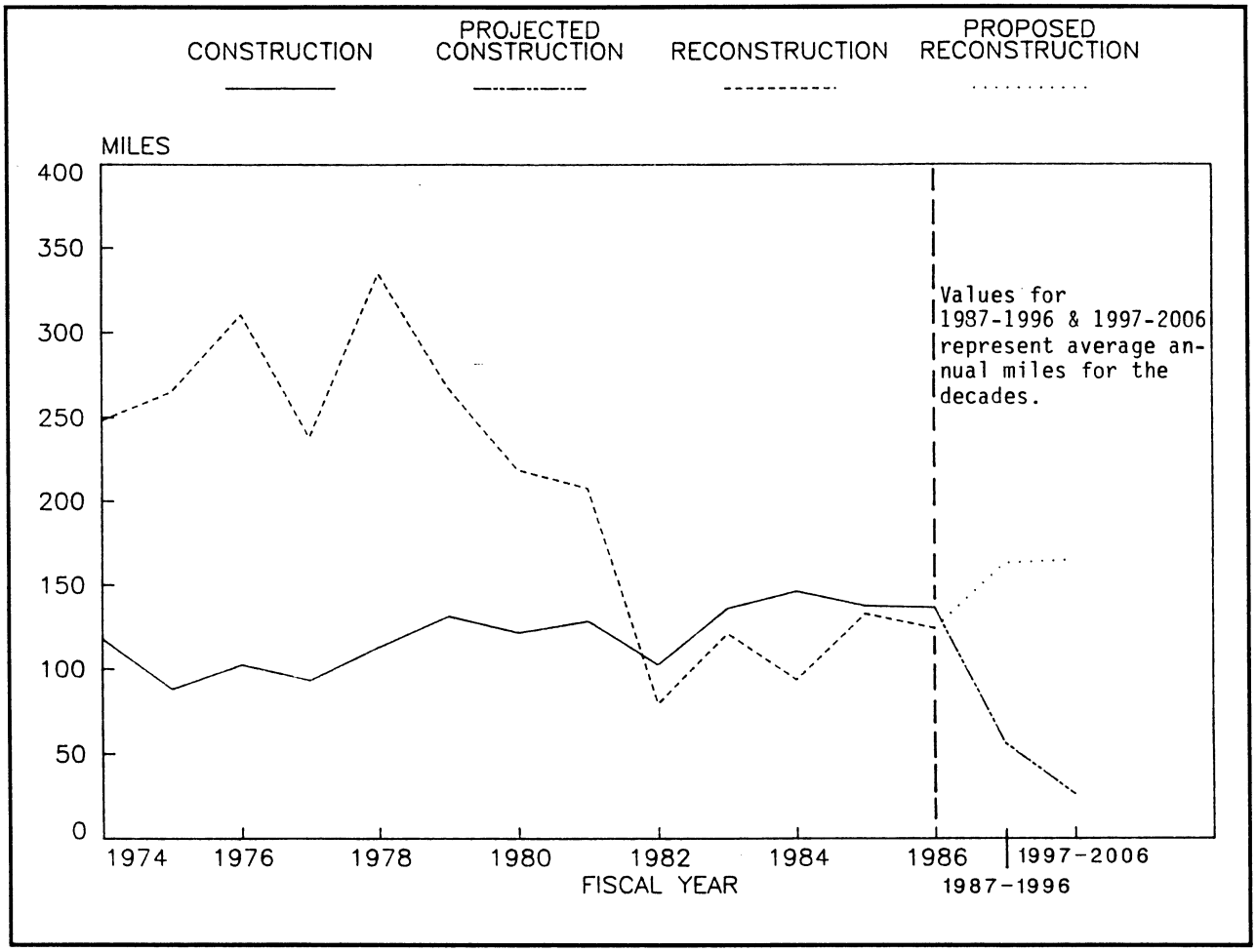
Future Trends

The development, maintenance, and management of the Forest development road system will continue as needed to respond to resource management objectives.

The rate of new road construction will continue to decrease as the road system nears completion. New roads constructed will be low standard (traffic service Level D) and usually will be maintained to Level 2 maintenance. Maintenance and reconstruction will increase in response to water quality needs on some existing roads. Some other existing roads may be closed to motor vehicle traffic and be minimally maintained (maintenance Level 1) for extended periods of time.

Some existing permanent roads will no longer be needed for resource management objectives. These roads will be permanently closed to motor vehicles; and have vegetative cover and natural-like drainage patterns reestablished.

Figure III-V-4. Road Construction and Reconstruction Mileage



TIMBER

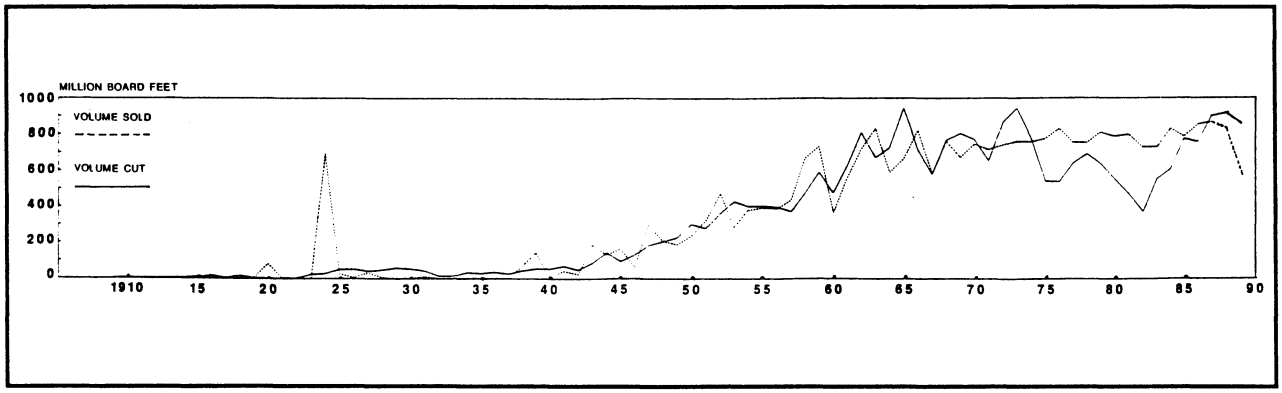
Trees utilized for commercial harvest are one component of vegetation. Timber is discussed with separately in Chapter III because of its importance as an economic resource and the effects that harvest has on other components of the environment.

Historic Trends

The earliest record of timber sale activity on the Forest was in 1909, when 100 MBF (gross) was sold for $106.00 ($1.06/MBF). The sale and harvest of timber was a minor activity for the first 3 decades, with the cut averaging about 23 MMBF per year. Management on the Forests during this time emphasized protection of the resources. In 1924, the Forest sold 696.3 MMBF, a large amount even by current standards. Of this amount in one huge sale of 685 MMBF to the Westfir Lumber Company of Oakridge was used to help establish a sawmill. The contract stipulated that not more than 50 MMBF could be harvested per year.

During and after World War II, the demand for wood products rose steadily and the sell and harvest of timber on the Forest kept pace. Management on the Forests began to favor development of the resources and sustained yield of timber. Since about 1962, the annual volume sold has remained about the same, averaging about 750 MMBF. During this time the volume cut has fluctuated from a low of 370 MMBF in 1982, to a high of 945 MMBF in 1973. Two other years have exceeded 900 MMBF, 1965 and 1988, with 943 and 908 MMBF respectively. The annual cut has averaged 708 MMBF per year. Figure III-W-1 shows the pattern of sell and harvest on the Forest from 1909 through 1989.

Figure III-W-1. Historical Perspective of Commercial Timber Sales: 1909-1989



The Forest has completed 3 timber inventories since 1962 which have assisted in the development of Forest Plans. The inventory information displayed in Figure III-W-2 shows the land base as it was inventoried, not as it was described and analyzed in the subsequent Forest plans. Changes in the total landbase are a result of land purchases and exchanges. Inventoried land base changes and trends can be summarized as follows:

- Nonforest lands have steadily increased as each inventory typed the land to tighter specifications.
- Unavailable lands have increased with additions to existing Wilderness and the addition of new Wilderness.

- Unsuited lands have shown a steady increase as definitions have changed and more information has been gathered concerning reforestation problems and unstable soils.

- As a result of increases in the above categories, the suited available land base has decreased by 25% since 1962.

- The amount of land occupied by timber stands that are less than 5.0" d.b.h. has increased since 1962 but should be close to leveling out. It takes the average stand about 30 years to reach 5.0" d.b.h., so the acres in this category are the harvested acres for the last 3 decades.

- The inventoried stands are those suited, available lands stocked by trees greater than 5.0" d.b.h. These have decreased with each successive inventory as a result of continued harvesting on a shrinking land base. These acres will level off under a given set of land allocations.

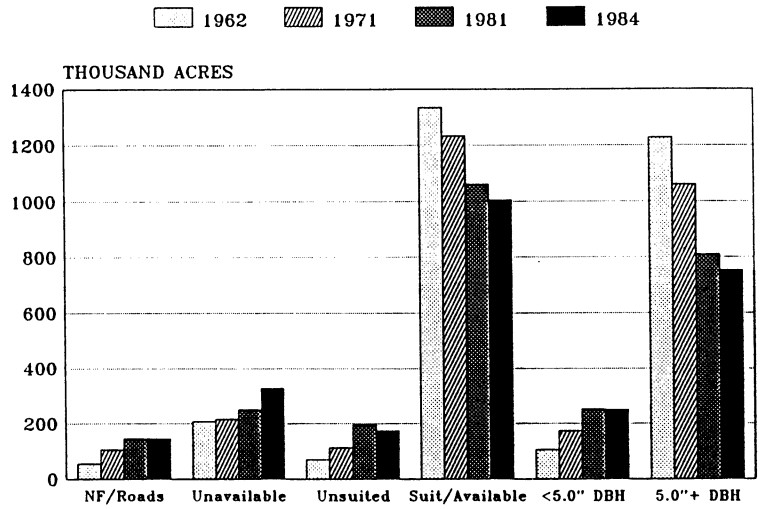
- The inventoried volume is the net volume from the stands greater than 5.0" d.b.h. and shows a decrease for the same reasons. This volume will eventually remain constant under a given set of management intensities.

- The average volume per acre has increased as a result of deleting the nonforest and unsuited lands from the inventoried land base.

Since the beginning of the current plan in Fiscal Year 1977, the potential yield has declined with the addition of new wilderness, while the annual volume sold has remained fairly constant, averaging 779 MMBF (gross). The volume harvested has averaged only 86% of the volume sold, or 672 MMBF. (See Figure III-W-3.) This resulted in an increase in the amount of volume under contract, from about 2.6 years in 1977 to 4.8 years worth of volume by the end of 1985. (See Figure III-W-4.) The increase in volume under contract was particularly noticeable in 1981 and 1982, during the worst of the recession, when only 59 and 51% of the volume sold was harvested.

Passage of the Federal Timber Contract Payment Modification Act in 1984, resulted in almost 2 years worth of volume being returned to the Forest (1,219 MMBF). An additional 279 MMBF of volume under contract was defaulted. For the last 3 years the volume cut has exceeded the volume sold, further reducing the volume under contract.

Figure III-W-2. Timber Inventory Comparison



* Reflects changes due to Oregon Wilderness Act of 1984

	Unit of Measure	1962	1971	1981	1984 [1]
Total NF Land Base	Acres	1,666,476	1,667,821	1,675,407	1,675,407
Nonforest Roads Change from Previous Inventory	Acres Acres %	55,202	104,510 + 89%	145,429 22,753 + 16%	145,429 22,753
Unavailable Change from Previous Inventory	Acres %	208,167	216,640 + 4%	251,246 + 16%	327,565 + 30%
Unsuited Change from Previous Inventory	Acres %	69,001	112,696 + 63%	195,318 + 73%	174,266 - 11%
Suited, Available Land Change from Previous Inventory	Acres %	1,334,106	1,233,975 - 8%	1,060,661 - 14%	1,005,394 - 5%
Stands Less Than 5.0" DBH Change from Previous Inventory	Acres %	104,793	174,050 + 66%	251,659 + 45%	250,494 --
Inventoried Stands (5.0"+) Change from Previous Inventory	Acres %	1,229,313	1,059,925 - 14%	809,002 - 24%	754,900 - 7%
Inventoried Volume Change from Previous Inventory	MMBF %	48,243	43,486 - 10%	34,033 - 22%	31,990 - 6%
Average Volume/Acre Change from Previous Inventory	MBF %	39.2	41.0 + 5%	42.1 + 3%	42.4 + 1%

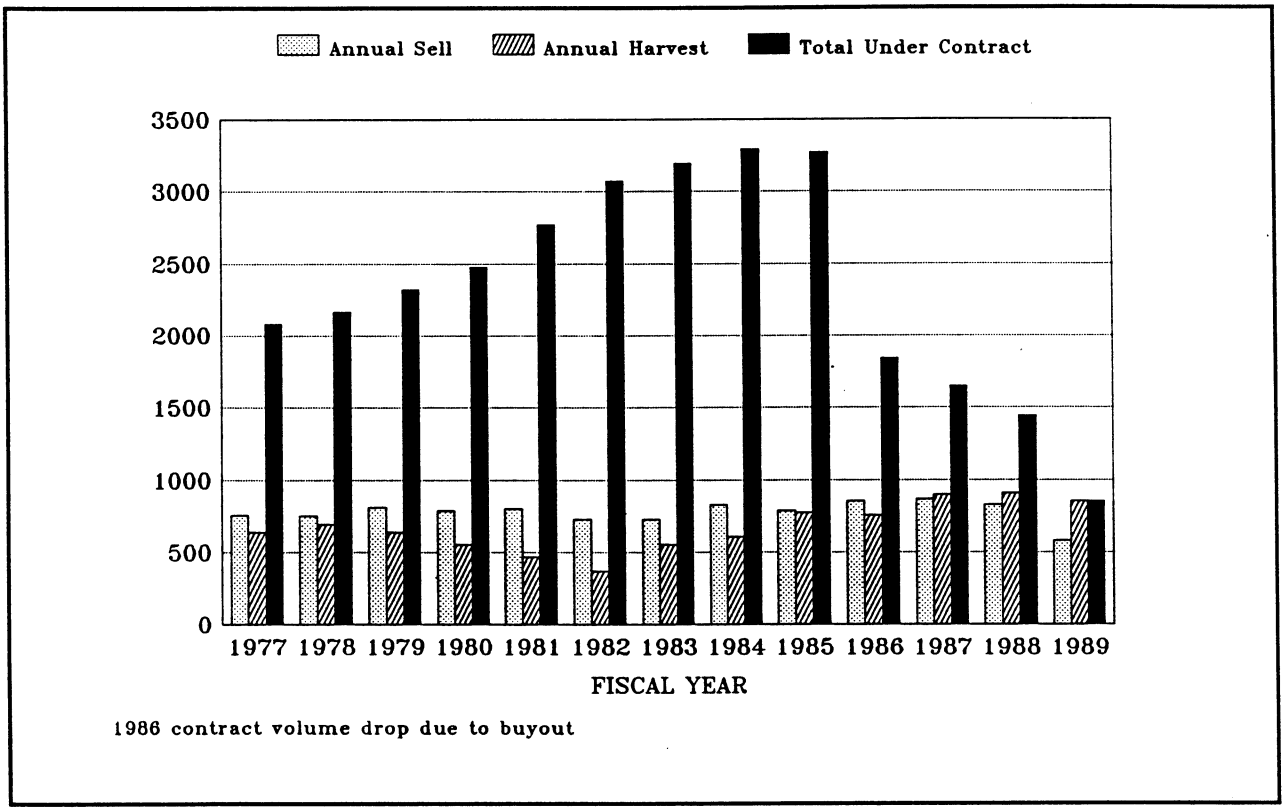
[1] Reflects changes due to Oregon Wilderness Act of 1984.

Table III-W-3. Potential Yield and Actual Volumes Sold and Cut

Fiscal Year	Potential Yield (MMBF) [1]	Sold (MMBF) [2]	Cut (MMBF) [2]	% Cut of Sold	Remarks
77	1,055	756.7	641.7	85	Implementation of Plan
78	1,055	755.3	693.1	92	
79	1,055	811.2	638.7	79	
80	1,042	788.8	554.0	70	French Pete Wilderness
81	1,042	799.8	470.7	59	
82	1,042	730.6	370.3	51	
83	1,042	731.1	555.0	76	
84	996	830.5	612.2	74	Oregon Wilderness Act
85	996	787.0	775.3	98	
86	996	853.7	758.4	89	
87	996	867.5	899.5	104	
88	996	826.9	907.7	110	
89	996	583.8[3]	854.9	146	
1977/89 Average	1,023.8	778.9	671.7	86	
1985/89 Average	996	784.3	839.2	107	

[1] This represents the maximum volume that could be produced, assuming no restrictions of funding or workforce, and solving all technical problems involved in managing marginal lands. Gross volume was estimated (for comparison to cut and sold volumes) by multiplying net volume from TM Plan by 1.25.
[2] Taken from the Forest cut and sold reports.
[3] Based on 234 MMBF (net) sold, plus 233 MMBF sold but not awarded until FY90. Net volume of 467 was multiplied by 1.25 to estimate gross volume.

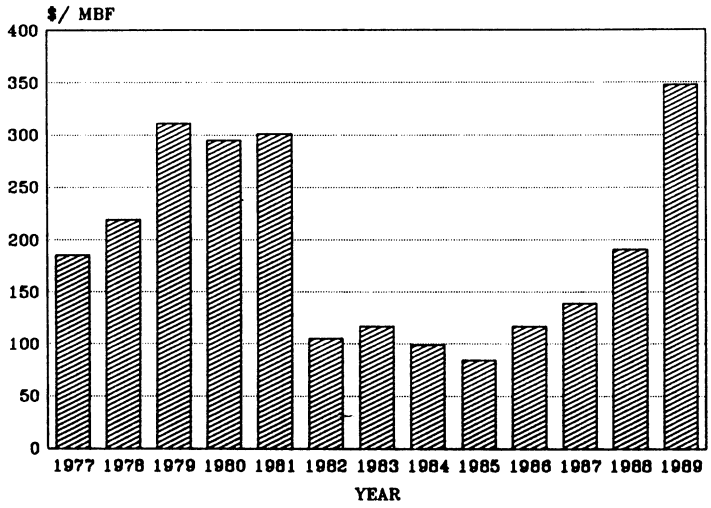
Figure III-W-4. Contract Volume



The average selling price of timber has varied widely since the earliest records beginning in 1909. The lowest average price was $0.16/MBF in 1938 and the highest average was $348.42/MBF in 1989. Figure III-W-5 shows the average selling price since the current plan went into effect.

Twenty-five percent of the total timber sale receipts from Forest lands and 50% of the receipts from converted Oregon and California Railroad grant lands are returned to the counties. The remaining funds go into the U.S. Treasury.

Table III-W-5. Average Selling Price of Timber [1]



Year	Volume Sold (MMBF)	$/MBF	Total Value Million $
1977	756.7	184.67	139.7
1978	755.3	218.82	165.3
1979	811.2	310.85	252.2
1980	788.8	295.38	233.0
1981	799.8	300.99	240.7
1982	730.6	104.95	76.7
1983	731.1	116.87	85.4
1984	830.5	99.49	82.6
1985	787.0	83.60	65.8
1986	853.7	116.68	99.6
1987	867.5	138.60	120.2
1988	826.9	190.93	157.9
1989[2]	583.8	348.42	203.4

[1]From Forest Cut and Sold Reports (does not include Purchaser Road Credits).
[2]Includes sales that were sold in FY89, but not awarded until FY90.

Current Situation

The 1981 timber inventory shows approximately 62% of the Forest is tentatively suited for timber management. (See Figure III-W-6.) This amounts to 1,032,138 acres, which is about 8% of the suited Forest land in Region 6. (See Regional Guide.) This is a falldown of 32,478 acres (3%) from the 1,064,616 regulated commercial Forest acres under the current plan after adjusting for the Oregon Wilderness Act of 1984. The change is due to better identification of unsuited soils and changes in land categories, particularly the dropping of the marginal category. Figure III-W-7 shows the Forest Land Classification under the current plan and can be compared with Figure III-W-6 to see the changes.

The total standing volume on the Forest, available for harvest (5.0" d.b.h. +), is about 33.0 billion board feet on 705,127 acres (from 1981 Timber Inventory Statistics updated through FY 1989). Douglas-fir is by far the predominant species accounting for 70% of the standing volume. Other important species include: western hemlock (14%), Pacific silver fir (4%), noble fir (4%), mountain hemlock (3%), and western redcedar (2.5%). The following species are also found on the Forest in small amounts (less than 1%) and are listed in order by volume: western white pine, grand fir, Engelmann spruce, sugar pine, incense cedar, lodgepole pine, alaska cedar, subalpine fir, and ponderosa pine. Hardwood species make up less than 0.2% of the standing volume with the most common being bigleaf maple, followed by black cottonwood, golden chinkapin, red alder and Pacific madrone. None of the hardwoods are commercially important as yet but they are very popular for firewood use.

In addition to the 33 billion board feet (BBF) of timber on tentatively suited lands, there is approximately 12 BBF on 325,000 withdrawn acres (poles and larger), and about 6 BBF on 130,200 unsuited acres. At the beginning of FY 1990, the total standing volume on the Forest was about 51 BBF on 1,160,000 acres of timber at least 5.0 inches in diameter.

Table III-W-6. Land Suitability for Timber Production

	Acres not Suitable for Timber Production	Total Forest Land Acres
Total National Forest Area		**1,798,737**
Other Ownerships	123,330	
Net National Forest Area		**1,675,407**
Water	23,101	(I-I.A)
Nonforest (not stocked with 10 % tree cover, or lands developed for other than timber production purposes)	123,052	
Roads	24,764	
Forested Lands (stocked with 10 % or more treee cover)		**1,504,490** (II - (II.A + II.B + II.C)D)
Withdrawn from scheduled timber production (219.14(a)(4))		
Wilderness	305,915	
Research Natural Areas	1,450	
Oregon Cascades Recreation Area	5,631	
H. J. Andrews Experimental Forest	14,505	
Irreversible resource damage (219.14(a)(2))	9,662	
Regeneration difficulty	135,189	
Lands tentatively suitable for timber production		**1,032,138** (III-(III A + B + C))
Forested lands not suitable for timber production	**472,352** (III - IV)	
Land status under existing timber management plan [1]	**547,024** Noncommercial Forested Land	**1,064,616** Commercial Forested Land [2]
Net reduction in lands tentatively suitable for timber production **1,064,616** (1971 Inventory) - **1,032,138** (1981 Inventory) = **32,478 Acres**		

[1]Amendment No. 2, July 5, 1984, after Oregon Wilderness Act.
[2]Includes standard, special, and marginal acres.

Table III-W-7. Current Land Management Plan Classification [1]

Land Classification		Acres			
Net National Forest Land Non-Forest + Unproductive		1,667,821 [2] - 247,088			
Productive Forest Land Productive Reserved Productive Deferred			1,420,733 - 297,129 - 2,807		
Commercial Forest Land				1,120,797	
Unregulated Commercial Forest Land				56,181	
Regulated Commercial Forest Land					1,064,616
Standard Special Marginal	793,553 145,959 + 125,104				
TOTAL	1,064,616				

[1] Amendment 2 (7-27-84)

[2] This differs from Figure III-W-5 (1981) due to land exchanges.

The biological potential yield of the Forest, including all forested lands, with no falldowns for other resource considerations, technical problems, or workforce requirements is estimated as shown in Figure III-W-8

Table III-W-8. Potential Yield

Land Classifications	Acres	Annual Yield MMBF (Net)
Tentatively Suited	1,032,138	763.2
Withdrawn	327,501	192.9
Unsuited	144,851	105.7
TOTAL	1,504,490	1,061.8

Four working groups represent the site class and vegetative associations of the Forest. These working groups are the basis for development of empirical and managed yield tables. (Appendix B of the FEIS contains more detail on how the working groups are modeled in FORPLAN.) The four working groups stratify the major species as follows:

1. Douglas-fir/Hemlock - This is the major working group on the Forest comprising about 82% of the available and suitable acres. It covers the whole broad spectrum of site and vegetation associations within the Douglas-fir, western hemlock, and grand fir series of forest communities.

2. Douglas-fir/True Fir - This group is made up of the Pacific silver fir and grand fir series, and accounts for about 10% of the suitable acres. Douglas-fir is the dominant species and is featured in management. Noble fir is also an important associate. Western white pine may also be found but is more commonly featured in the true fir or mountain hemlock types. The strata is cooler and generally wetter than the Douglas-fir/hemlock type with snow cover common in the winter. It starts at about 3,000 feet on certain slopes and aspects and reaches maximum area between 3,500 and 4,000 feet.

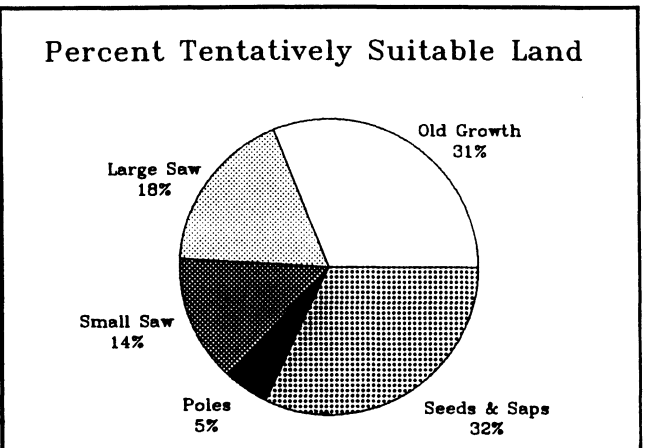
3. True Fir - This working group occurs in the Pacific silver fir series and occupies the least area on the Forest with about 3% of the suitable acres. It occurs in the same elevation range as the Douglas-fir/true fir strata but on cooler and wetter sites. Most of it lies on the rolling uplands of the New Cascades. Noble fir is the preferred management species with Douglas-fir, silver fir, white pine, and Englemann spruce as minor associates.

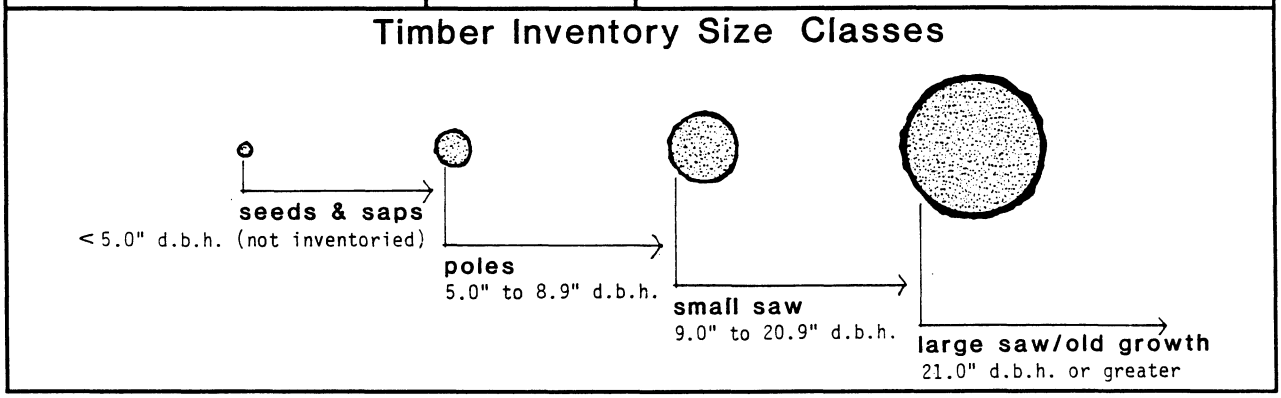
4. Mountain Hemlock/Lodgepole Pine - This working group occupies the highest and coldest areas of our commercial Forest land and occurs in the Pacific silver fir and mountain hemlock series. This group totals about 5% of the suitable acres and is located on the rolling land of the High Cascades. Seral species include lodgepole pine, silver fir, white pine, Englemann spruce, and noble fir. Alaska yellow cedar and Douglas-fir are minor associates. The cedar tends to occur in well defined pockets. The lodgepole pine is often a pioneer species on cold, frosty sites; then silver fir and mountain hemlock come in underneath the lodgepole pine, replacing it in 60 to 80 years.

As part of the inventory process, stands are grouped into the four size classes illustrated below. Figure III-W-9 shows the tentatively suited acres by size class (1981 inventory).

Figure III-W-9. Tentatively Suited Acres by Size Class

Size Class	Acres
Seedlings and Saplings	326,985
Poles	57,485
Small Sawtimber	140,930
Large Sawtimber	189,113
Old Growth [1]	317,625
TOTAL	1,032,138





[1] See Chapter III, Section G, Vegetation for information on old-growth.

Under the current plan, the total annual sell program of timber on the Willamette National Forest has averaged about 779 million board feet (gross). This represents about 15% of the timber production from Forests in Region 6 (Oregon and Washington) and about 7% of the production from the entire National Forest System (Regional Guide).

Timber management has been guided by a Timber Management Plan approved in 1977, which programmed an annual net sell volume of 615.6 MMBF. The plan has been amended twice to account for reductions in the land base due to new Wilderness and to take into account the effect of Timber Stand Improvement (TSI) accomplishments. The latest projections indicated the reduction in acreage was offset by increased TSI work and the net sell volume actually increased to about 641 MMBF.

Future Trends

National and Regional Timber Supply

The principal projections used in guiding the development and evaluation of long-range plans and programs for management of the Forests are contained in the latest Forest and Rangeland Renewable Resources Planning Act (RPA) Assessment (i.e., the 1984 Update and the President's Statement of Policy, September 19, 1986). These projections focus on the long-term (50 years) in 10-year increments

and do not recognize short-term local and regional fluctuations. A summary of projected RPA trends for timber supplies follows:

Hardwoods - The current balance between growth of wood and its removal shows that the hardwood forests and eastern softwood forests can support additional timber harvests. This balance will change, however, and future harvests, particularly in the decades beyond the year 2000, could vary over a wide range. Nonetheless, if commercial timberland owners continue to respond to price and inventory changes, timber harvests can be increased substantially in most geographic regions during the next few decades. Hardwood increases are expected to rise from about 3.4 billion cubic feet from 1980 to 9.4 billion in the year 2030 (RPA 1984). The largest increases will be in the South.

Softwoods - Total projected softwood roundwood harvests are expected to increase from 9.6 billion cubic feet in 1980 to 11.9 billion cubic feet in the year 2030. Though the outlook is for increased softwood harvests nationally, there are important differences among the major softwood timber producing regions.

In the Douglas-fir subregion, projected annual harvest from 1980 to 1990 is about 2.3 billion cubic feet. It then declines slightly to about 2 billion cubic feet per year. This level is roughly maintained through the rest of 50-year projection period.

In contrast softwood timber harvests in the South are projected to rise from about 4.1 billion cubic feet in 1980 to 7.3 billion in the year 2030. Much of the expansion in the South is due to greater diversification in its wood products production as compared to other regions of the country.

Local Timber Supply

Potential timber supply levels from the Forest have been calculated for each of the Alternatives presented in Chapter II of this document. To fully assess the potential impacts of these supply levels on the local timber industry, it is necessary to understand the relationship between the demand for and the supply of timber in the local market area of the Forest's affected environment. The significance of the impacts of changes in timber supply from the Willamette will depend upon assumptions about both future demand and the future supply available from other ownerships in the market area.

The major portion of the market area for timber from the Forest consists of Lane, Linn, and Marion counties in West-Central Oregon. Approximately 97% of the total land base of the Forest is located in these three counties. Over 98% of the total harvest from the Forest is processed into wood products in this three-county area. Small amounts are processed in some of the other adjacent counties with the most generally going to Douglas County. Of the amount processed in the three-county area about 66% is processed in Lane County, 27% in Linn County, and 7% in Marion County. The percent harvested by county is similar to the percent processed.

Both the demand for wood products and the supply of timber are important to the health of the timber industry. In the past, demand-related factors have been primarily responsible for the fluctuations which have occurred in the market for timber. The supply of timber has generally been abundant. There is some evidence, however, that this may be changing for some regions of the country including Western Oregon. A number of studies done within the last 10 to 15 years have pointed to the real possibility that harvest levels from private industrial lands will decline during the next 2 or 3 decades. This could occur because of reduced inventories brought on by harvesting in recent decades at levels higher than can be sustained over time. The harvest projections in one of these studies, *Timber for Oregon's Tomorrow: The 1989 Update* will be used here and in Chapter IV to assist in the assessment of the impacts of Forest harvest levels on the total available supply in the market area.

There are three major influences on the potential supply level: the amount of land available for harvest, the intensity of management on those acres, and the harvest flow schedule (nondeclining flow or departure). The available acreage is the most significant influence, since large changes in standing timber volume are directly related to land allocation. Departure from nondeclining flow can increase harvest level temporarily, but entails a decrease sometime in the future. Intensive management practices influence the supply level by affecting the growth rate of trees. The most effective practices for increasing and improving growth are planting of improved stock (genetics), stocking level control (precommercial thinning) and fertilization.

The most recent timber resource inventory of all ownerships in the study area was done by the Forest Service's Pacific Northwest Forest and Range Experiment Station in 1973-1976. The most recent inventory of the Forest was completed in 1981. Figure III-W-10 presents the entire study area by land class. Figure III-W-11 shows the amount of commercial forest land by ownership and the volume of growing stock. Of particular interest is that while the Forests contain less than half of the total acres of commercial forest land in the three-county area, they have (or had) over two-thirds of the existing growing stock. In contrast, forest industry owns over 24% of the commercial timberland, but has only about 13% of the existing growing stock. This indicates that industry has historically been harvesting its own lands at a faster rate than the harvest on the Forests.

A comparison of the Forest and industry inventories further supports this point. About half of the Willamette's suited timberland contains old-growth and large sawtimber while only about 17% of industry's land is in this timber size class. The % of industry's land that is in the smallest size class (i.e., seedlings, saplings, and nonstocked) is also about twice that of the Forests.

Table III-W-10. Study Area [1] by Land Class

Land Class	Thousand Acres	% of Total
Commercial Timberland	3,474	67.9
Reserved Timberland	201	3.9
Other Forest Land	184	3.6
Non-Forest Land	1,259	24.6
TOTALS	5,118	100.0

[1] Lane, Linn, and Marion counties.

Table III-W-11. Commercial Timberland and Volume of Growing Stock [1]

	Commercial Timberland		Volume of Growing Stock			
Ownership Class	Thousand Acres	% of Total	MMCF	% of Total	MMBF	% of Total
National Forests	1,608	46.3	11,330	67.7	67,343	69.2
BLM	382	11.0	1,690	10.1	9,925	10.2
State & Other Public	77	2.2	376	2.3	2,062	2.1
Forest Industry	841	24.2	2,112	12.6	12,015	12.3
Other Private	565	16.3	1,226	7.3	6,006	6.2
TOTAL	3,473	100.0	16,734	100.0	97,401	100.0

[1] Study Area = Lane, Linn, and Marion counties.

An examination of actual harvest levels shows that between 1970 and 1988 the harvest from industry lands nearly equaled that from Forest lands. Figure III-W-12 shows the average annual harvest levels by county and ownership class for the market area.

Harvest on industry and Forest lands accounted for an average of 83% of the total harvest in the market area. Thus, significant changes in the harvest levels from either ownership will impact the total harvest of the area.

As the result of present stand conditions, the supply of timber from forest industry lands is expected to drop significantly for a period of time during the next 10-20 years. Figure III-W-13 displays actual and projected harvest levels from the various ownerships within the study area.

Table III-W-12. Summary of Timber Harvest [1]

	Lane County	Linn County	Marion County	Total
Forest Industry				
Average Annual Harvest	436	324	22	782
% of County Total	35	52	23	40
Other Private				
Average Annual Harvest	48	43	7	98
% of County Total	4	7	7	5
State				
Average Annual Harvest	8	8	7	23
% of County Total	1	1	7	1
BLM				
Average Annual Harvest	163	49	8	220
% of County Total	13	8	8	11
Forest Service				
Average Annual Harvest	594	197	53	844
% of County Total	47	32	55	43
TOTAL	1,249	621	97	1,967

[1] 1976 to 1988 summary in millions of board feet (MBF).

Table III-W-13. Average Annual Actual and Projected Harvest Levels [1]

Timbershed	Time Period	Forest Industry	Other Private	BLM	National Forests	Total
Eugene	1970-79	459	47	165	636	1,307
(Lane County)	1980-85	379	50	128	478	1,035
	1986-95	313	54	182		
	1996-05	74	54	182		
	2006-15	199	127	182		
	2016-25	222	118	182		
	2026-35	267	118	182		
Mid-Willamette	1970-79	339	76	66	256	737
(Linn & Marion counties)	1980-85	383	27	38	205	653
	1986-95	403	59	47		
	1996-05	302	64	47		
	2006-15	102	118	76		
	2016-25	142	108	76		
	2026-35	165	108	70		
TOTAL	1970-79	798	123	231	893	2,045
	1980-85	762	78	167	683	1,690
	1986-95	716	113	229		
	1996-05	376	118	229		
	2006-15	301	245	258		
	2016-25	364	226	258		
	2026-35	432	226	252		

[1] Millions of Board Feet.

Future harvest levels are based on projections developed in the study *Timber for Oregon's Tomorrow* by Beuter, Johnson, and Scheurman (also known as the Beuter Report). This information has been updated to 1989, but was not available to change the data in Figure III-W-13. These projections reflect a specific set of assumptions about the rate of harvest and management intensity for all ownerships. In this study, all ownerships are assumed to maintain their current level of intensified management. The rate of harvest for public ownerships is held constant for the first 3 decades with private ownerships trying to maintain the total harvest level of the area. Figure III-W-13 shows the actual harvest level for Forest lands, not the level which was projected in the study. Harvest for all ownerships is maximized subject to a long-run sustained yield constraint after the 3rd decade.

These projections indicate that if the harvest from public lands remains at current levels or declines, the total supply available to processors in the three-county area would be reduced beginning in the 2nd decade. Opportunities for alleviating this potential falldown by augmenting the supply with timber from adjacent areas are not realistic. The only western Oregon timbershed which could provide additional volume is the North Coast timbershed. Haul distances associated with obtaining timber from this or any other region, however, would create a significant competitive disadvantage for mills in the Willamette's market area.

The supply of timber available for harvest in the market area will not, by itself, dictate the future condition of the local timber industry. Demand for wood products will also affect the amount of timber that is harvested. In general, demand for timber from the Pacific Northwest was quite low during the recession of the early 1980s. High interest rates, the influx of inexpensive timber from Canada, and the expansion of the South's market area contributed to the reduced demand during this period.

In 1985, however, demand for timber rebounded dramatically as the total timber harvest in Oregon was at a record high level. Lower interest rates and a record level of raw log exports contributed to the increased harvest. There was little change in the amount of wood processed, however, and the value of the wood products produced actually declined.

Despite the record harvest in 1985, employment in the woods products industry declined. Increased productivity, automation, and a desire to reduce costs continued the trend that began a couple of decades ago and accelerated during the recession. Substantial reductions in employment occurred during the recession as many of the older mills closed or cut back on production. Some of this employment is returning as smaller companies are reopening mills with smaller but more efficient operations.

One measure of the potential for the timber industry to meet future demand within a market area is the installed capacity of local mills. Area mills will operate at the capacity needed to provide the wood products demanded by society. Figure III-W-14 shows how the number and capacity of mills in the three-county area have changed between 1968 and 1982.

Table III-W-14. Trends in the Forest Products Industry [1]

	1968		1972		1976		1982		1985	
	No.	Capacity [2]	No.	Capacity [2]	No.	Capacity [2]	No.	Capacity [2]	No.	Capacity [2]
Sawmills										
Lane	41	3,913	41	4,724	38	5,176	22	3,767	22	3,326
Linn	17	1,235	14	1,276	13	1,067	10	1,070	11	985
Marion	9	405	7	602	6	395	5	390	4	620
Totals	67	5,153	62	6,602	57	6,638	37	5,227	37	4,931
Veneer & Plywood										
Lane	34	4,386	33	4,491	32	5,760	23	3,692	22	4,066
Linn	13	1,047	13	1,050	15	1,934	11	1,660	12	1,374
Marion	2	350	3	376	2	380	3	540	1	400
Totals	49	5,783	49	5,917	49	8,074	37	5,892	35	5,840
Pulp, Paper, & Board Plants										
Lane	5	1,729	5	3,300	4	2,763	3	1,400	3	1,300
Linn	6	3,494	8	3,100	7	1,451	6	1,225	7	1,415
Marion	1	240	1	275	1	248	0	0	0	0
Totals	12	5,463	14	6,675	12	4,462	9	2,625	10	2,715

[1]Source: Oregon's Forest Products Industry (1968, 1972, 1976, 1982, and 1985), Resource Bulletins, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service.

[2]Capacity Measured in the Following Units:

- Sawmills; Thousand Board Feet (MBF) per 8-hour shift;
- Veneer and Plywood; Thousand Square Feet (MF) per 8-hour shift, veneer production only;
- Pulp Mills; Tons per 24 hours.

While estimates of future demand for Forest timber involve a number of assumptions and contain a great deal of uncertainty, they are necessary to assess the overall supply implications of land management planning alternatives. Figure III-W-15 contains estimates of demand for Forest timber.

Table III-W-15. Projected Demand for Willamette National Forest Timber [1]

Peiod	Estimated Total Demand	Non-Willamette NF Harvest	Demand for Willamette
1986-1995	1,533-2,045	1,264	269-781
1996-2005	1,533-2,045	930	603-1,115
2006-2015	1,533-2,045	1,009	524-1,036
2016-2025	1,533-2,045	1,049	484-996
2026-2035	1,533-2045	1,096	437-949

[1]Million Board Feet per Year

These projections were developed using the process and assumptions discussed as follows.

The actual amount of wood harvested and processed in any given time period provides a measure of demand for wood from a particular area. A range of potential future demand can be estimated from high and low periods of harvest. In the Willamette's market area, a high level of sustained production (an average of 2,045 million board feet per year) was maintained during the 1970 to 1979 period. A very low level of production (1,533 million board feet occurred during the recession of 1980 through 1982. These two extremes provide a realistic range of potential future demand assuming the many variables affecting supply and demand do not exceed the limits of variation experienced during these time periods.

Demand for Forest timber can be estimated by subtracting nonnational forest and other Forest harvest from the range of total estimated demand. "Demand" is defined as the volume of Forest timber that would be purchased (if available) by area mills in response to the combination of demand for final products and supply from other sources. The potential supply provided in the land management planning alternatives will be evaluated relative to this range of potential demand in Chapter IV of this document (see "Cumulative Effects of Alternatives on Timber").

Demand

Over the next 10 years, timber demand from the Pacific Northwest geographic region will grow slowly. Although there is a backlog of unfulfilled housing demand, the future will depend primarily on the continuing strength in personal income and the availability of affordable housing and financing. In addition, projections of exports to the Pacific Rim countries show a continuing slow economic growth. The analysis acknowledges there will be a declining trend in the construction sector. Structure replacement, rather than new construction, will characterize the market. The projections for increases in demand may be described as considerably restrained and cautious (Nomura 1981).

The long-term outlook for the solid wood products industries contains a number of challenges. Evaluation of recent data and information indicates that the demand for timber is changing to a moderate rate of increase as compared to the slowdown that occurred in the early 1980s.

The ability to sustain this increase on a long-run basis is linked to the critical issue of costs. The short-term future of timber and wood products demand is clouded by factors, such as the severity and length of the housing and wood products recession that began in 1980. The long-term trends in housing demand, the growing popularity of construction methods that use less wood, availability of wood substitutes, and a shift in business management strategies and methods, all contribute to a potential shift in future demand (Adams and Haynes 1985).

Wood supply will continue to be an issue in the sense that it will be highly dependent on the ability of producers to lower costs to be competitive with wood substitutes (Schallau 1986).

Although overall current timber supply levels in the Pacific Northwest region may be capable of meeting future demand, there are some problems within the subregional market areas. This needs to be recognized in terms of a shifting of industry within the region and also in the shifting emphasis on the types of wood products produced, as well as the ability of the subregion to supply the various kinds of wood needed.

A broader vision of the future that includes developing a flexible regional basis for stabilizing wood supplies and applies to forward-looking perspective on wood fiber management, will also better allow the Pacific Northwest timber industry to utilize the opportunity to increase exports to international markets. To achieve this, the Forest products industry will need to learn the workings of a different market system and provide more products in the form demanded. (Campbell et al. 1983.) In addition, actions by industry, such as modernizing facilities, adopting state of the art technology, reducing costs, and diversifying into other sectors of production (similar to what the southern region has done) could help to rebuild and stabilize the wood based sectors of the region (Schallau 1985).

Private and Public Land Interrelationships

Currently, part of the timber formerly supplied by the Pacific Northwest Region is now being supplied by the South and Canada. However, the supply situation from these other sources can be expected to change as soon as about 6 years, or at least by the year 2000. The projected change indicates a drop in supply capability of 30 to 50% from the current relatively high levels. By the 2nd decade (2000-2009), shortly after the drop in supply begins in other regions, the growth of wood fiber on private lands in the Pacific Northwest will start increasing. The private lands in the Pacific Northwest could then become a major source of supply for softwoods to meet national and international demand. Further, during the period before the private lands in the region regain their full supply potential, the public forests would be looked upon as a major source for a relatively stable supply of wood fiber (Schaullau 1985).

The land use planning process determines the range of harvest levels that the Forest can meet under a variety of conditions. This information is fed into the Resources Planning Act process which establishes Forest targets over a 5-year period plus long-term targets for a 5-decade period beyond that. These targets are adjusted on an annual basis depending on funding levels and political decisions. There are also targets for acres of reforestation and timber stand improvement.

The RPA target for timber production programs increases from a low of 792 MMBF in 1982 to a high, sustained yield of 870 MMBF in 2001. (See Figure III-W-16) The RPA program has not yet been updated to account for recent changes, like the Spotted Owl Management guidelines.

Table III-W-16. 1980 RPA Targets [1]

	1982	1983	1984	1985	1986-1990	1991-2000	2011-2010	2011-2020	2021-2030
MMBF	792	802	812	823	834	869	870	870	870
MMCF	145	147	149	151	153	159	160	160	160
Refor. (M Ac.)	17.154	16.990	16.800	16.675	15.729	15.200	15.500	16.920	16.920
TSI (M Ac.)	1.070	10.800	10.710	10.620	9.360	9.360	9.720	9.900	10.080

[1] Includes cull volume.

Figure III-W-17 shows the Forest targets contained in the Forestry Program For Oregon (FPFO). The FPFO data also needs to be updated to reflect recent changes affecting the acres available for timber management.

Table III-W-17. Forestry Program for Oregon [1]

Decade	MMCF/YEAR
1980	146.2
1990	149.2
2000	146.4
2010	145.5
2020	143.7
2030	141.0
2040	137.9
2050	136.0
2060	135.8
2070	135.1

[1] Based on 1,005,394 suited acres. Includes cull volume.

The Forest timber production levels play an important role in the Forestry Program for Oregon (FPFO) developed by the Oregon Department of Forestry. The Forestry Department documented the goals and objectives for the FPFO in the *1980 Oregon Timber Supply Assessment* using the computer program TREES (Timber Resource Economic Estimation System) to model harvest levels from all ownerships. The results indicate the longer the industry maintains harvest at the present rate, the greater the eventual decline in timber harvest from these lands. If industry immediately drops its current harvest from about 730 MMCF/year to a sustainable level of about 500 MMCF/year, Oregon's total harvest would decrease by 14% unless the other ownerships picked up the slack. The FPFO contribution from the Forest is estimated to be 149.2 MMCF (gross) per year for the decade beginning in 1990. This is close to the RPA target of 153 MMCF per year. To provide these levels of harvest, the Forest would have to depart from nondeclining yield as authorized by 36 CFR 219.12(d).

The 1990 draft update of the FPFO does not list volume targets for the Forests or other ownerships. Instead, the Board of Forestry has adopted six objectives to "ensure jobs and a quality environment

for all Oregonians, today and for future generations." Regarding timber growth and harvest levels, the objective is to "Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations and taking into consideration landowner objectives."

Below-Cost Sales

The issue of below-cost timber sales has recently surfaced as a concern of the Forest Service and many members of the public. A below-cost sale is one in which total Forest Service costs exceed revenues. There is currently much discussion on how to analyze available timber sale information so that an assessment of below-cost sales can be made. Areas of particular concern include the type of analysis (i.e., cash flow or cost efficiency), the scope of analysis (i.e., Forest-wide, area-wide, individual projects, per acre, or some combination), the time frame of the analysis (i.e., annual or multi-year), and which benefits (or revenues) and costs should be included.

Many of these questions are interrelated and the cost-efficiency analysis used in the land management planning process represents one approach to the analysis of the issue. In this section, the issue is being addressed using an annual Forest-wide cash flow approach. (See Figure III-W-17.) This is designed to give an overall perspective of the magnitude of the below cost sales problem on this Forest.

Because the values and costs for any given year are for different groups of timber sales, the net receipts are not a direct reflection of the below-cost sale issue. The fact that net receipts averaged 24.8 million dollars over the seven year period is an indication that the Forest does not have a problem with below-cost sales. Only 1 year (1982) had a negative result where total cost exceeded gross receipts. The reason this happened is because 1982 had the lowest volume harvested since 1952, and had the least dollar value per MBF since 1976. This combination provided the lowest gross receipts since 1971. By contrast, the costs for 1982 were due to road construction, brush disposal, and reforestation associated with timber sales over the previous 2-5 years, and represents one of the highest total costs ever at 54.4 million dollars, due to the high level of harvest.

The negative value for 1982 is due to the difference between when the receipts are received and when the costs are incurred for a given sale, and not the result of below cost sales. To this point in time there have been few, if any, timber sales in the Forest that were below-cost.

Some potential exists for certain types of sales to have costs which exceed revenues. As the Forest begins to prescribe harvest of more smaller diameter material either through commercial thinnings or as a result of final harvests under shorter managed rotations, the total value of the timber will tend to decrease given a continuation of current market conditions and price-diameter relationships. Since costs will generally not follow this same trend, some sales may not be economical to harvest.

Another type of sale where total costs could exceed revenues is one that occurs in areas which require special protection for other resource values such as scenery, dispersed recreation, wildlife, and water quality. Numerous constraints on harvesting, including limits on unit sizes, are contained in prescriptions which emphasize multiple-use objectives. These result in higher timber management costs without an increase (and possibly a decrease) in total revenues. The total multiple-use benefits of these types of sales are not reflected in the Forest's cash flow analysis of a timber sale.

To deal with this concern about below-cost timber sales, Congress directed the Forest Service in 1984, to design a new accounting system that would report all costs and benefits of the timber sale program. The Timber Sale Program Information and Reporting System (TSPIRS) was developed and tested, and is now being implemented service-wide. The first official reporting year will be 1989.

The economic effects of the trend towards harvesting smaller diameter material and incurring increased costs for other resource objectives become more important for sales in areas dominated by low value species. On the Willamette, lower values are associated with stands of high elevation species including mountain hemlock, lodgepole pine and the true firs.

Efforts have been made by Forest managers to provide some direction and assurance that future timber sales will be economical from both an efficiency and cash-flow perspective. An example of this is the limitation placed on the minimum average stand diameter available for commercial thinning. A 12-inch diameter provides enough volume to cover the costs of the average sale. Other restrictions based on economic considerations include limiting the number of commercial thinnings for an individual stand and limiting the area that can be commercially thinned based on accessibility.

In addition some areas which are uneconomical to manage for timber production on a cash-flow basis are either dedicated to other uses before the Forest-wide FORPLAN analysis or fall out of solution as uneconomical from a cost-efficiency standpoint. The FORPLAN model will provide the most cost-efficient solution for the specific multiple-use objectives of each Alternative.

Despite efforts to make individual sales return at least as much as they cost, an examination of the total sales program may indicate that receipts did not exceed revenues due to fluctuations which can occur in the demand for timber. While the costs of selling timber may remain relatively constant, revenues for a particular year fluctuate with the amount harvested. This is due to the multi-year nature of timber sales. Figure III-W-18 contains the cost and receipt information for the Willamette.

Table III-W-18. Comparison of Timber Sale Values and Costs

			Values (MM$)			Costs (MM$)				
FY	Volume (MMBF) [1]	$/MBF	Timber Value [2]	Road Value [3]	Gross Receipts [4]	Appro-priated [5]	Allocated [6]	Roads	Total Costs	Net Receipts
1980	554	165	62.0	29.7	91.7	9.2	11.7	29.7	50.6	41.1
1981	471	153	47.7	24.4	72.1	12.1	13.5	24.4	50.0	22.1
1982	370	104	7.7	30.7	38.4	11.7	12.0	30.7	54.4	-16.0
1983	555	108	44.3	15.8	60.1	8.5	8.6	15.8	32.9	27.2
1984	612	107	53.1	12.2	65.3	14.0	11.1	12.2	37.3	28.0
1985	775	100	62.8	15.1	77.9	12.9	13.3	15.1	41.3	36.6
1986	758	95	60.3	12.1	72.4	9.9	15.8	12.1	37.8	34.6
1987	899	123	95.4	15.5	110.9	7.6	12.7	15.5	35.8	75.1
1988	908	155	125.4	14.9	140.3	8.8	14.3	14.9	38.0	102.3
1989	855	196	153.2	14.0	167.2	9.8	23.2	14.0	47.0	120.2
Ave.	676		71.2	18.4	89.7	10.5	13.6	18.4	42.5	47.1

[1]Volume figures include all convertible products harvested.
[2]Value includes all products, Christmas trees, etc. Also includes K-V and BD collections.
[3]Road costs are part of total value and include appropriated road construction, purchaser road construction, engineering, design, and administration.
[4]Gross receipts include timber and road values.
[5]All timber sale costs including program management, sale preparation, administration, stand exams, etc. Does not include road costs.
[6]Includes K-V, brush disposal (BD), salvage sale fund (SSF), and cooperative work (CWFS).

Implementation of the Forest Plan will include monitoring and analysis of the economics of individual timber sales or groups of sales. This will be done to assess the accuracy of planing assumptions and evaluate sale-specific concerns using site-specific economic information. Decisions to harvest and how best to do it will then be made on a sale-by-sale basis considering the differences in important economic and noneconomic factors.

Silvicultural Systems

Silvicultural systems are used to manage forest stands as identified in Agriculture Handbook No. 445. A silvicultural system is a planned sequence of treatments for controlling the species composition and structure of the vegetation during the life of a stand. A stand is a community of trees sufficiently uniform to be distinguishable as a silvicultural or management unit. A stand can be defined as a reasonably homogeneous unit that can be clearly differentiated from surrounding stands by its age, composition, structure, site quality, or geography.

A silvicultural system typically includes cutting trees, growing new trees, and controlling competing plants. Cuttings are classified as regeneration cuttings (those that help to replace stands), and intermediate cuttings (those that maintain or improve the character of existing stands, i.e., thinning harvests). Silvicultural systems are adaptations of natural occurrences. Nature makes "regeneration cuttings" by means of fire, insects, disease, wind, and other phenomena, by removing a single tree, a small group of trees, a stand, or sometimes a whole forest.

Selection of the appropriate silvicultural systems occurs at both the National Forest Land Management Planning level and Ranger District project level by considering the overall planning objectives and ecological characteristics of the Forest. At the Ranger District, project level selection of silvicultural systems is typically made by a certified silviculturist. Choices are based on matching the attributes of the silvicultural systems with specific management objectives and ecological characteristics for specific stands.

The clearcutting, seed-tree, and shelterwood systems are even-aged systems, which means that all of the trees in the stand are approximately the same age. The single-tree and group selection systems are uneven-aged systems because the trees in the stand differ markedly in age, with at least three major age classes present. Uneven-aged stands have no beginning or end points in time.

Even-aged management, with clearcut or shelterwood as the principal regeneration systems, is predominantly implemented on the Forest for the following reasons:

- Even-aged and group selection systems favor plants that can be readily established and which grow well in full sunlight (shade-intolerant plants). Many of our major tree species including Douglas-fir are shade intolerant to various degrees.

- To obtain high timber yields and growth rates, there must be strict control of stocking in regenerated stands. The other option, uneven-aged management, assumes continual replacement of old trees with new. This assumption of prompt regeneration poses a serious difficulty because of sporadic natural regeneration, brush invasion and competition, climatic and economic considerations, and silvicultural characteristics of many common tree species. However, uneven-aged management can be applied where greatly reduced timber yields are acceptable for meeting other important resource objectives (e.g., streamside or visually sensitive areas where maintenance of a forested aspect is important).

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- Stand structure is typically poorly balanced in terms of age and size class distribution in our existing stands. The oldest (or largest) trees in any managed forest depend primarily on the management objectives, not on the silvicultural systems. In particular the amounts of large-growth or old-growth to be produced or maintained depend more on cooperatived reductions in yield than on the kinds of silvicultural systems implemented to manage stands.

- The steep topography and rugged terrain found over much of the forest would cause excessive damage to reserve trees during frequent harvest entries. Repeated harvests of the largest trees have often caused undesirable results: understocked residual stands with lower quality, lower value trees.

A full discussion of silvicultural systems and management practices is found in Appendix F.

Tree Improvement

Increasing demand for timber and concern over management costs, indicate a need to produce more volume per acre per year. One method of doing this is to use sound genetic principles to increase growth, improve tree form and wood quality, and increase resistance to disease, insect, and animal pests. The forest is currently planting seedlings from seed collected from superior trees. Seed orchards are being established to further improve the quality of planting stock. Genetic improvement can also be realized through careful selection of trees to be left after precommercial and commercial thinnings as well as overstory trees in areas not clearcut.

Timber Stand Improvement

This refers to cultural treatments that improve the composition, condition or growth of a stand of trees. These treatments include release from brush competition, precommercial thinning and fertilization. Approximately 20% of new plantations require release from brush, 87% require pre-commercial thinning, and fertilizer can be applied to all stands with at least 60% Douglas-fir stocking.

Another form of TSI that has not seen much use in the recent past is pruning limbs to produce high-quality clear wood. However, in the future the Forest Service will be one of the few producers of large trees due to the NFMA requirement that rotation age is at least 95% CMAI (60-120 years). Most other forest landowners are managing on economic rotations of 40-60 years. As the old-growth available for harvest decreases, the demand for clear wood will increase. At the present time, pruning appears to be a neutral investment, but the potential is there for a significant gain in PNV (Mayo 1986). Opportunities will depend on funding and employment considerations.

MINERALS AND ENERGY

The National Forest System by coincidence of geology is a principal storehouse of mineral and energy resources. The search for and production of mineral and energy resources are statutorily authorized uses of the National Forest System, except for those lands formally withdrawn from mineral activities by Act of Congress or by executive authority. The Wilderness Act of 1964 has withdrawn designated Wilderness from all appropriation under the mining laws and minerals leasing acts, subject to valid existing rights.

The Forest encourages, facilitates, and administers the orderly exploration, development, and production of mineral resources to meet present and future needs of the nation integrated with the use, conservation, and protection of other resources.

Mineral activities on the Forest are encouraged in accordance with the national Mining and Mineral Policy Act, and the various applicable Federal and State statutes governing protection of the environment, including air and water quality. The Statutory and regulatory direction separate mineral resources in publicly owned lands of the United States into three categories: locatable, leasable, and salable.

Locatable Minerals

Locatable minerals are those valuable deposits subject to exploration and development under the U.S. General Mining Law of 1872 and its amendments. Commonly, locatables are referred to as "hardrock" minerals, which are naturally-occurring, solid, and usually inorganic compounds. Examples include gold, silver, copper, and zinc.

Citizens, and those who have declared their intent to become citizens, have the statutory right to explore for, claim, and mine mineral deposits on Federal lands including those of the National Forest System subject to 36 CFR 228 and other laws of the United States. Through a Memorandum of Understanding with the Bureau of Land Management (BLM), U.S. Department of the Interior, the Forest Service administers most aspects of U.S. Mining Laws on National Forest System lands. In addition, under the regulations in 36 CFR 228, the Forest Service approves exploration and mining operating plans and administers those operations to ensure protection and reclamation of affected surface resources.

The Forest contains four mining districts: Blue River, Fall Creek, North Santiam, and Quartzville. (See Figure III-X-1 on Mining Districts.) Most of the past and present mining activity is concentrated in the one million to 70 million year old volcanic rocks associated with dioritic and related intrusion. The mineralization occurs in veins which trend northwest and dip steeply. The four districts include the mineralized areas on the Forest which have the highest potential for locatable minerals. Even these areas are small isolated pockets with questionable potential.

Most of the mining activity on the Forest took place from the late 1800s to the early 1900s. During that time, the districts produced over $400,000 in gold, silver, and copper. Recent increases in the price of gold and silver, plus improved mining and metallurgical, techniques have stimulated recreational and commercial interest in the old deposits. An increase in recreational activity has been evident during the summer months and on holiday weekends particularly in the Little North Santiam and Quartzville areas. This may result in more trespasses on areas that have been withdrawn from mineral entry.

Probable future mineral activities include continued prospecting and exploration, and possible development of locatable mineral deposits in the vicinity of the mining districts (drilling, road building, and underground development), and new discoveries outside areas of previous activities. In the more

distant future, the potential exists for development of high grade copper breccia pipes in the North Santiam. The past and estimated future potential for minerals production is shown in Figure III-X-2.

Leasable Minerals And Energy

Leasable minerals include fossil fuels (coal, oil, gas, oil shale, etc.), geothermal resources, potassium, sodium, phosphates, and sulphur. These minerals are subject to exploration and development under leases, permits or licenses granted by the Secretary of the Interior. The controlling statutes currently are the Mineral Lands Leasing Act of 1920 and amendments, the Mineral Leasing Act for Acquired Lands of 1947, and the Geothermal Steam Act of 1970.

The Secretary of the Interior's authority is administered by the Bureau of Land Management (BLM). When National Forest System lands are involved, the BLM requests the Forest Service's recommendation for minerals, other than coal, subject to the 1920 Act, or the Forest Service's consent decisions for minerals subject to the 1947 and 1970 Acts and for all coal deposits. Forest Service recommendations for and consent to the BLM for leasing, permitting or licensing (except for coal) include appropriate stipulations to be included in the issued document for the management of surface resources. The Secretary of the Interior, through the Office of Surface Mining (OSM) for coal, and through the BLM for other minerals, has the authority to administer operations on leased National Forest System lands.

Prior to approval of operating plans, the Forest Service participates with BLM or OSM in the formulation of the site-specific terms and conditions of operating plans, so that the plans provide appropriate mitigation measures to ensure that adverse impact on surface resources will not exceed applicable environmental protection standards. Plans must be designed to minimize the impacts of operations on other uses and surface resources and to provide for prompt reclamation or restoration of affected lands upon abandonment of operations. All such plans and activities shall be an outgrowth of environmental analysis that complies with the National Environmental Policy Act of 1969 (NEPA 1969) procedures.

The Forest is not considered favorable for oil and gas exploration because the Western Cascades are generally composed of nonmarine material of volcanic origin. The High Cascades are characterized by recent volcanic cones, lava flows, and shield volcanoes which would indicate a low potential for oil and gas. In the 1970s there was a surge in lease applications after natural gas was discovered near Mist in the Coast Range. The Forest had about 200,000 acres in lease applications of which most have been terminated due to lack of payment or withdrawn due to cost of exploration and stipulations imposed to protect the resources. These measures reduced chances of recovering investments for the companies.

The Forest contains numerous hot springs and other indicators (such as areas with high heat flow) of geothermal systems at depth. Three hot spring areas, Breitenbush, Belknap-Foley, and McCredie-Kitson are classified as Known Geothermal Resource Areas (KGRAs) by the U.S. Geological Survey.

The Oregon Department of Geology and Mineral Industries identifies additional areas that merit further geothermal exploration the Forest; they include the upper McKenzie River, Horse Creek, and Willamette Pass (Priest and Vogt 1982). The target areas are characterized by high heat flow and are located adjacent to faults where the potential for fracture permeability is high.

There has been considerable interest in geothermal leasing on the Forest. During 1980 and 1981 private companies drilled over 55 exploratory temperature gradient holes and one 9,000-foot test well. Although no discoveries have been made to date, geothermal exploration in the area continues. The location of an energy source may lead to some potential for development on the Forest.

Figure III-X-1.

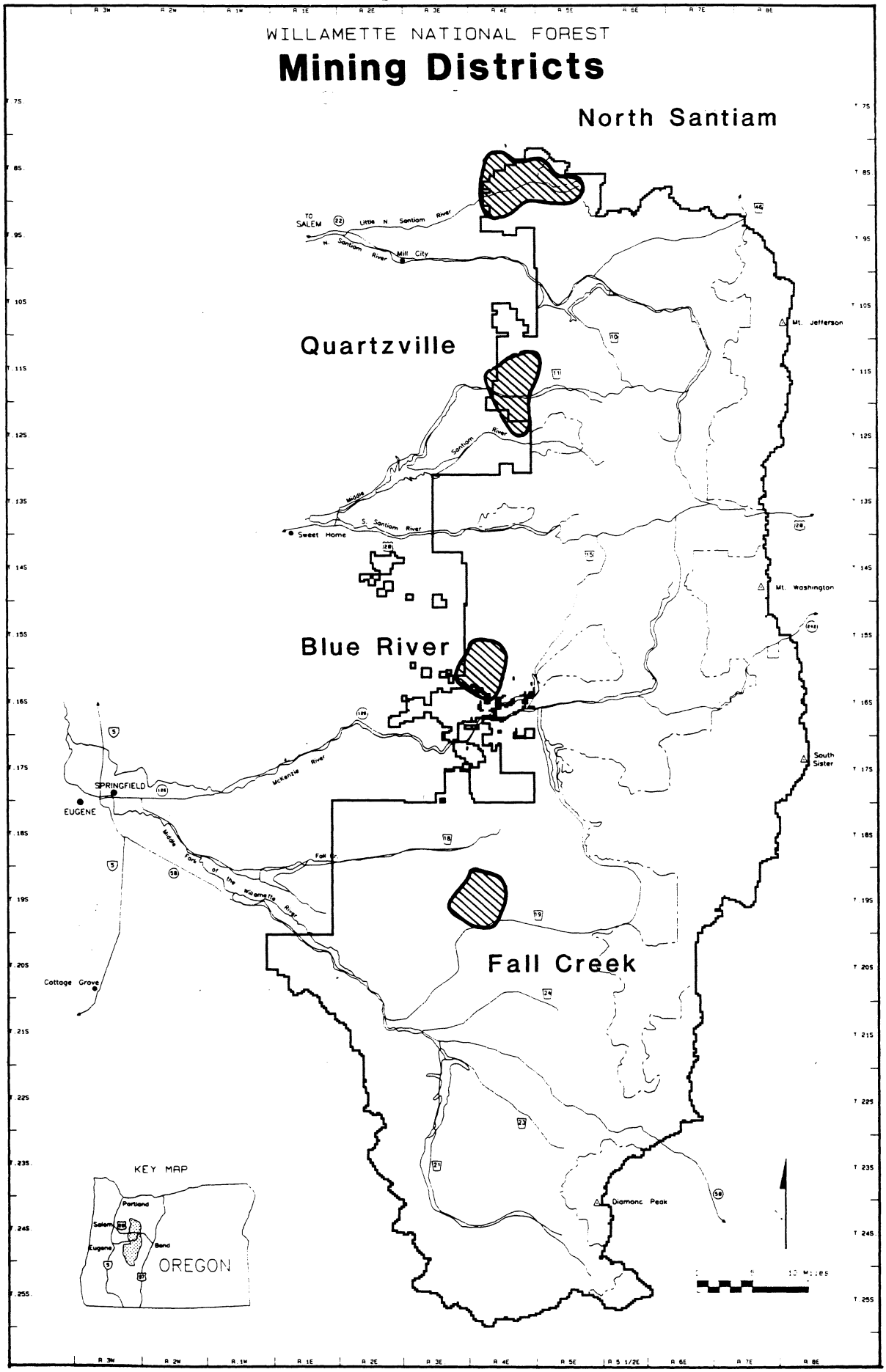


Table III-X-2. Minerals Production



District	Ore Extracted [1]	Minerals	Future Potential
North Santiam	$25,000	Gold, silver, copper, zinc, lead	Active exploration by major company. Medium potentia for gold, copper, gold, and silver.
Quartzville	$181,255	Gold, silver	Minor prospecting, Low potential for copper, gold, and silver.
Fall Creek	Unrecorded	Gold	Limited present activity. Low to medium potential for gold & silver.
Blue River	$200,000	Gold, silver	Limited present activity. Low potential for gold, silver, & copper.

[1] Dollar values at time of production, 1890-1940, from Gold and Silver in Oregon by DOGAMI.

Demand for leasable energy resources has dropped significantly in the years since the initial "energy crisis" of 1973 to 1974. The Northwest Power Planning Council projects an energy surplus for the Pacific Northwest until the 1990s. Thus, in the near term, it seems unlikely that any large-scale energy production or development will occur on the Forest. However, as industry looks to the long term and the development of alternate energy sources, activities associated with identifying potential supplies on the Forest are expected to increase.

Salable Minerals (Common Varieties)

A Federal Mining Statute known as the Act of July 23, 1955, removed common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay from the category of locatable minerals. The Act placed the common varieties under the Materials Act of 1947. This 1947 Act authorizes disposal of materials, including, but not limited to the above common varieties, on public lands through a sales system.

The use of common variety minerals is mostly for Forest road construction and maintenance in the form of gravel. The High Cascades provide a suitable inventory of good rock sources due to the fairly young nature of the rock. The Western Cascades provide some rock sources but not as many.

Rock sources are located within centralized areas of road development so cost of hauling rock is lowered. There are about 170 active rock sources. Traveling on a road where rock is being hauled can be hazardous where recreation and timber operations may conflict with gravel trucks.

The existing and potential supply of gravel is expected to be adequate to meet anticipated needs until the year 2000. As the inventory is completed, a better estimate will be possible. Demand for small mineral sales (common variety) will continue at about the same or slightly increased rate.

Gemstone sources are quite limited and those known are used by the recreation visitor or "rock hound." Jasper and agate are the principal stones to be found. One source of petrified wood, which is not classed as a gem stone has been located. Several sources of emery stone have been located and prospected to some extent, but have proven uneconomical to work.

Mineral Withdrawals

The Forest's early efforts in withdrawing lands from mineral location involved administrative sites at various locations across the Forest. More recent requests have involved special areas such as roadside zones, the H.J. Andrews Experimental Forest, and some recreation areas. Other withdrawals involved hydroelectric power development and flood control sites. These were quite extensive, covering most of the major streams on the Forest. In the early 1970s these withdrawals represented about 75% of the total area of the Forest where mineral entry on the land was prohibited. Now this has declined to about 40%. Much of this change is the result of reopening Federal Power Commission licensed sites. In accordance with the Wilderness Act, as of December 31, 1983, designated Wilderness became withdrawn from appropriation under the mining and mineral leasing laws, subject to valid existing rights.

As of 1985 there are 447,958 acres where mineral entry is prohibited by specific withdrawal authority. In addition, there are about 90,916 acres covered under special uses, power applications, and power sites where mineral entry is restricted. The USDA Forest Service has authority over 26 withdrawals, which are included in the above acreage figure.

The Forest must review all 26 withdrawals over which it has authority. The review will determine if the withdrawal is to be continued, revoked, or modified. This must be completed by 1990 as required by the Federal Land Policy and Management Act of 1976. The Forest is not responsible for withdrawals that were initiated by other agencies such as the Federal Power Commission or the Army Corps of Engineers.

There will continue to be lands withdrawn in the future. The Forest will make additional requests for withdrawal of lands where natural ecosystems are to be protected or where mining activities are not compatible with land management objectives. However, revocation of withdrawals may be requested where protection is no longer needed.

SOCIAL AND ECONOMIC ENVIRONMENT

Introduction

Forest planning focuses on resource-related issues and assesses the environmental, social, and economic impacts of alternative management choices. To make this assessment, the various components of the environment which are affected must be identified. This section of Chapter III describes the social and economic environment which is affected by management of the Forest. Some of the information presented here is a summary of a more comprehensive document on the subject which was prepared for the Forest by Linda Peterson in 1983. That document, *Socio-Economic Overview of the Forest's Area of Influence*, is on file as part of the Forest's planning records.

The Forest is located on the western slopes of Oregon's Cascade Range, within a two-hour drive of Oregon's major population centers in the Willamette Valley. It lies primarily in Lane, Linn, and Marion counties, but also extends south into Douglas County, east into Jefferson County, and north into Clackamas County. (See Figure III-Y-1.)

The Forest's resources play an important social and economic role in these and other Oregon counties as well as in the Pacific Northwest and the Nation. The goods, services, and uses available from or on the Forest represent major components in the lives of many people who live adjacent to or near the Forest.

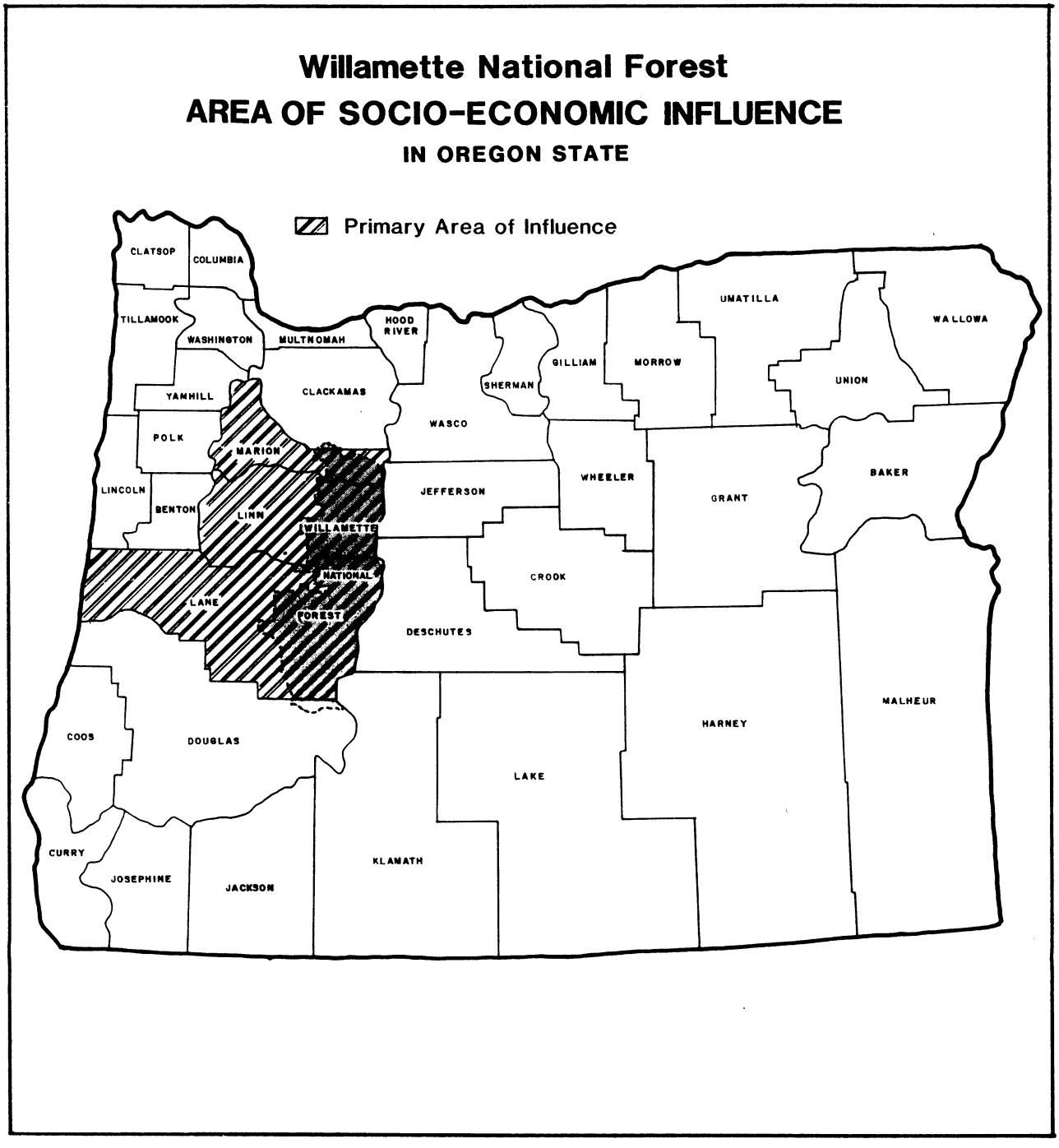
Many local communities rely on the employment and income generated from the use of Forest resources. A measure of stability is derived from a continuous supply of timber being available for harvest from the Forest, even though supply is not the only determinant of stable markets. Income and employment are also derived from people traveling through communities on their way to use the Forest for recreation and other purposes. An awareness of tourism's importance as a source of future economic and social activity for communities in and adjacent to the Willamette Valley is growing.

In addition to economic activity, the quality of people's lives is greatly enhanced by the physical environment associated with the Forest. A diversity of topography, vegetation, wildlife, and other resources opportunities provide for a variety of quality recreation experiences; and the many scenic and other attractions provide an attractive place to live and work.

All of these goods, services, and uses have value to the people who live in the area. Changes in the quantity or quality of these attributes affect their lives. With a limited resource base and increasing demands from a growing population, conflicts or issues related to the relative values of different goods, services, or uses are bound to arise.

A look at current and expected future conditions in areas influenced by the Forest will be useful to project possible changes in the socio-economic sectors as a result of implementation of any of the Forest Plan alternatives.

Figure III-Y-1. Area of Socioeconomic Influence



Area Of Influence

The area or zone of Forest influence was established by identifying the users of the Forest's resources. The major resources of the Forest include recreation opportunities, fish and wildlife, timber, and water. Each resource is used, processed, or consumed by different, though overlapping, segments of the population located in varying proximity to the Forest. The influence area for this analysis is defined by county boundaries and has been separated into a primary influence area and a secondary influence area.

The primary area of influence includes the counties of Lane, Linn, and Marion in Western Oregon. Each of the three counties contains portions of the Forest. Industries in the primary counties tend to process the bulk of the Willamette National Forest's timber and mineral resources, while also supplying the majority of the recreation users to the Forest. In addition, the counties receive millions of dollars of Federal timber receipts on a yearly basis, depending on the timber harvest volume and bid price for the timber (see the later section on payments to the counties).

A secondary area of influence includes four Western Oregon counties--Benton, Polk, Yamhill, and Douglas and one county in Central Oregon, Deschutes. Douglas and Deschutes counties border the Forest, while the other secondary counties are nearby and border the three primary counties. Although the five secondary counties tend not to share the same resource or recreation uses on or from the Forest, they receive or process some timber and mineral resources and provide some recreation users.

There are other counties and states that are marginally influenced by the management of the Forest. This is apparent in terms of recreation visitors and indirectly through the use of lumber products. The many lakes on the Forest, the migrating Chinook salmon and steelhead that spawn on the Forest streams, as well as the pristine Wildernesses, draw thousands of persons from the western states and other counties. However, the measurable influence that the Forest management alternatives have on these distant persons, counties, states, or nations is almost impossible to calculate.

Social Environment

Historic Trends

Western Oregon has a rich and varied history that was shaped by the people who moved to the area and the natural resources that were readily available. Predominant in the economic development of the Western Oregon region have been agriculture, mining, forestry, and later recreation. Initially, in the 1830s and 1840s agriculture was subsistence oriented. As the settlement base increased, the diversity of agricultural products also increased as cattle, sheep, wheat, corn, and garden vegetables were introduced in the 1850s. Through time, agriculture expanded its base with new varieties of herd animals, wheat and grains, fruits, nuts, and more recently, horticultural specialty crops.

Mining has periodically contributed to the economy of the area. It is one of the least documented activities and probably occurred on a larger scale than has actually been reported. The Blue River, North Santiam, Fall Creek, and Quartzville Mining Districts are located within the Forest boundaries. Today, they remain as some of the most important mining areas in the Western Cascades, although present activities are of a very small scale.

The timber industry has been of paramount importance in the economy of the Willamette's area of influence. On a noncommercial basis, the native trees were utilized by the early trappers, miners, and settlers for shelter and heating. In addition, the settlers removed many of the trees from their homesteads

so that agricultural products could be grown in the fertile soils. By the early 1850s small sawmills were scattered throughout the area and the commercial effort became somewhat profitable. Many townsites were established near the mills and transportation systems. New technology evolved from simple whipsaw operations to more sophisticated steam powered mills. By the early 1900s the lumber industry began to develop a substantial market outside the area, relying on the Southern Pacific railroad system for transportation of lumber products. Today, the timber base is very strong, with centralization, computer technology, and an integrated trucking system assisting the industry.

Transportation systems proved to be important to the development and continued survival of the local communities. The mid-1870s brought the Oregon and California (O&C) Railroad, which boosted the economic potential of the area. The railroad linked the region to new market areas. The Southern Pacific Railroad, which purchased the Oregon and California Railroad, provided some stimulus to help draw emigrants, through the selling of their Federal railroad grant lands. Yet many of the unsold lands were returned to Federal ownership in 1916 as the railroad company did not comply with the terms of the land grant. Administration of these lands became the responsibility of the General Land Office (later called the USDI Bureau of Land Management) and the USDA Forest Service. The O&C land payments which comprise 50% of the gross receipts (constrasted to 25% of standard natural Forest lands), in lieu of taxes, contribute to the economic base for the counties in the Willamette's area of influence.

The highway system in the region developed slowly. Prior to 1920 it relied on numerous local farm roads and a few county funded roads. By the mid-1920s, the State of Oregon began to fund a modern highway system, enabling the construction and paving of the Pacific Highway (U.S. 99), which connects the major population centers of Western Oregon together. In addition, several old wagon roads and toll roads over the Cascade Range were reconstructed in the 1920s and 1930s to an improved standard, with modern widening and paving occurring in the 1950s and 1960s. The latest highway improvement has been the construction of Interstate 5 during the 1960s. The all weather I-5 north-south corridor is the major transportation route, commercial zone, and recreational access for Western Oregon. It also links Oregon to markets and people in California and Washington.

Recreation is another component to the area's economy which has gradually expanded. Initially hot springs, hunting, fishing, and camping were the principle Forest attractions to residents and tourists. By the 1920s remote hot springs and resorts, as well as the high mountain lakes, attracted venturesome tourist expeditions. During the 1930s federal and state actions, often assisted by the Civilian Conservation Corps enrollees, enhanced the recreation potential by establishing numerous campground facilities through Western Oregon, especially along the state roads that cross the Forest. After World War II came the surge of recreation users for hunting, fishing, camping, boating, and many other recreational pursuits. In the last two decades, new recreational interests have expanded into such areas as backpacking, rock climbing, downhill and cross-country skiing, photography, river boating, rafting, and many other outdoor pursuits. As populations grow, so will the need for more recreational opportunities.

The vast timber resources of the Forest were barely tapped until World War II ended, when full scale development of a Forest road system allowed a vastly increased use of the Forest. The highest point of Western Oregon's timber industry was in the 1950s for both production and total employment. Since that time, the production levels have lowered, and the employment has been reduced.

Over 150 years of population growth and natural resource development in Western Oregon have helped to shape the people of the area. The zone of influence is still substantially dependent on natural resource related industries and employment. The three counties (Lane, Linn, and Marion) rely on timber receipts, agriculture, and recreation for a good portion of their income. Much of the recent change in employment

in Western Oregon has been towards secondary or service related jobs and in the future fewer jobs will be directly tied to natural resource production. The ease of transportation and increased leisure time, especially to the metropolitan cities of Western Oregon, has increased the recreation use on the Forest. It is expected that in the future even more persons will take advantage of the living conditions and recreational and job opportunities in the area. The physical attributes which enhance the quality of life for the people living and working near the Forest are also expected to help attract other industries to the area as local economies continue to diversify.

Population

The population in the Forest area of influence is comprised of rapidly growing county seats, smaller communities adjacent to main transportation routes, and rural families and farms. The inhabitants of this zone (see Figure III-Y-2) comprise almost 34% of the state total (1980 census), with most of the concentration around the metropolitan areas of Eugene-Springfield and Salem. There are several small cities within the external National Forest boundary including Oakridge, Westfir, McKenzie Bridge, Detroit, and Idanha.

The prospects for employment and an outstanding natural setting have led to a population growth of over 65% in the Willamette Valley in the last 20 years. This tremendous growth has occurred whether national and state economies have been strong or weak. The population in the State of Oregon has been increasing every decade, with the largest percent increase between 1900 and 1910, when there was a 62.7% rise. The years from 1940 to 1950 showed a rise of 39.6%. The next fastest growth period was from 1970 to 1980 when a spurt of 25.9% was recorded. Urban areas within the state grew at a faster rate during 1970 and 1980 than the rural areas, yet much of the urban growth was in cities with less than 25,000 population. There are no indications that this continued upward trend in the state will reverse despite the small declines in population growth during the early 1980s.

Within the Forest's primary zone of influence, the growth of county populations has taken a similar upward trend. All three counties grew at a rate higher than the state. The lowest change of population from 1970 to 1980 was in Linn County with 24.5% growth, while Lane County grew 27.8%, and Marion County gained 35.3%. The average change for the primary zone was more than 3% above the Oregon average for the same period. During the 1980s population in Lane County dropped in the 1980-1988 period only reaching above the 1980 census during 1988-1989. Linn County dropped below the 1980-census only in 1981 and 1982 and rose above in 1983, a trend which continues. Marion County, on the other hand, never dropped below their 1980 population, gaining almost 20,000 persons in the 9-year period.

In the secondary zone of influence all five counties are above the state growth rate with Deschutes County considerably above. Benton and Polk counties were just above the state average, Yamhill and Douglas counties were higher, with Deschutes County more than four times the state average for growth. The secondary area has about 60% of the population of the three primary counties.

Table III-Y-2. County Populations - Trends and Projections

	PRIMARY ZONE							
	Actual Population [1]			Projected Population [2]				
County	1960	1970	1980	1990	2000	2010	2020	2030
Lane	162,890	215,226	275,226	292,000	334,200	376,500	424,300	478,000
Linn	58,867	71,914	89,495	96,900	109,500	123,400	139,000	156,600
Marion	120,888	151,309	204,692	228,300	267,700	310,600	339,800	382,900
TOTALS	342,645	438,449	569,413	617,200	711,400	801,500	903,100	1,017,500
	SECONDARY ZONE							
Benton	39,165	53,776	68,211	73,900	84,300	95,000	107,000	120,600
Deschutes	23,100	30,442	62,142	75,800	102,100	115,000	129,600	146,000
Douglas	68,458	71,743	93,748	99,000	114,700	129,200	145,600	164,000
Polk	26,523	35,349	45,203	48,300	55,700	62,800	70,700	79,700
Yamhill	32,478	40,213	55,332	63,400	75,300	84,800	95,600	107,700
TOTALS	189,724	231,523	324,636	360,400	432,100	486,800	548,500	618,000

[1] Census data from the decade Federal Census for each decade.
[2] The 1990 and 2000 projections are based on the Center for Population and Census estimated population increase for the years 1980-2000 (Center for Population Research and Census, 1984). Projections for beyond the year 2000 were calculated with an average percentage increase of 1.2 percent per year, using the average Bonneville Power Administration population projections for the primary counties (Bonneville Power Administration, 1979).

Current Population

Population in the Forest's primary zone of influence was last estimated in 1989, by the Center for Population Research & Census at Portland State University, to be 594,000 persons or 21% of the State of Oregon total of 2,791,000 persons. Lane County, which has the largest population of the primary counties, has an adjusted estimate of 280,000 persons or 10% of the total in the state. Marion County has about 224,000 persons or 8% of the state. Linn County contributes the smallest proportion with 90,000 persons or 3% of the state population. These official estimates compare favorably with the 1980 census where the three counties comprised 21% of the total state population.

The Forest's secondary zone of influence has about one-half of the population of the primary zone. The five counties of Benton, Deschutes, Douglas, Polk, and Yamhill contribute 345,100 persons or 12.4% of Oregon's population.

Overall, the total Forest zone of influence contains an estimated 939,100 persons or almost 34% of the Oregon population. Two-thirds of these people reside in the primary zone, while the remainder live in the secondary zone. The state of Oregon has about 2.8 million persons, most of whom are concentrated in the large urban areas of the Willamette Valley. Eugene-Springfield and Salem, the

largest cities in the zone of influence, are termed Metropolitan Statistical Areas (MSA), which means that they are eligible for higher funding and special economic programs as defined by the Office of Management and Budget. Salem, in Benton County, is also the state capital.

Population Projections

Based on studies completed in the mid- to late 1970s, (the most recent population projection estimates), the population of Oregon is expected to increase by 250,000 by 1990, 420,000 more by 2000, 418,000 increase by 2010, and 531,000 additional people by 2030. Approximately two-thirds of these new people will find homes and employment in the Willamette Valley. The Forest's primary zone of influence is projected to grow at a slower annual rate than at present (see Figure III-Y-2). Despite the slower rate, Lane County should expect a large increase in population. The secondary zone will experience similar growth patterns, but the total increase will be much smaller. Deschutes County will be the exception, where the population could dramatically increase if the current trends continue.

Overall, the relative population increases in the zone of influence will have a real impact on the Forest. More people means a greater demand for outdoor recreation, forest products, and a higher density of automobiles on the forest road system. As the year 2030 is less than 50 years away, the Forest needs to effectively plan for a steady increase in demand by Forest users. In addition, these people will need employment opportunities, which the Forest will indirectly impact. The larger quantity and greater concentration of people will express more concerns and place more demands on the Forest to provide clean water, air, and recreation, as well as protection of soils and enhancement of visual resource conditions.

Minorities

The last federal census in 1980 (the 1990 census not available until 1991 or 1992) indicated that minority composition within the Forest's primary zone of influence was over 24,000 persons (see Figures III-Y-3 and III-Y-4). This was smaller (4% of total population) than the state percentage (7.9%). Marion County had more minority persons than the other primary counties, with 11,342 members (5.5%), while Lane County had 10,636 persons (3.8%), and Linn County had the least with 2,199 minority persons (2.4%). Lane County had more Black Americans (1,618) followed by Marion County (1,258), and Linn County (135). All three counties had different proportions of Native Americans, averaging about 1%. Both Lane and Marion counties had relatively the same proportions (1%) of people claiming Asian descent, while Linn only had one-half as many as either county. Marion County had a higher percentage (4.7%) of persons of Hispanic origin, who can be of any minority group, with Lane about 2.0% and Linn with about 1.8%.

The secondary zone of influence also had relatively low numbers of minority persons (3.6%) which was almost 2% lower than the state averate. Benton County had the largest proportion of minority people with 5.1%, followed by Polk County with 4.5%, Yamhill at 4.1%, Douglas with 2.5%, and Deschutes County at 1.8%. The minority category with the greatest number of persons was Other, which does not include Hispanic origin or white (4,433), followed by Asian (3,054), American Indian (2,854), and Black (909). The percentage of people claiming Hispanic origin in the secondary counties averages 2.4%, just under the state average of 2.5%. Polk and Yamhill counties contained the highest percentage of Hispanic origin people (around 3.4%), while the other three counties averaged 1.8%.

Table III-Y-3. People of Hispanic Origin by County, 1980

	County			
	Lane	Linn	Marion	Total Area of Influence
Not of Hispanic Origin	269,654	87,870	194,990	552,514
Hispanic Origin				
Mexican	3,495	1,090	7,940	12,525
Puerto Rican	238	52	147	437
Cuban	68	15	56	139
Other	1,780	468	1,559	3,807
TOTAL PERSONS	275,235	89,495	204,692	569,422

Source: U.S. Census, Summary Tape File 1.

Table III-Y-4. Persons by Race, 1980

	County			
	Lane	Linn	Marion	Total Area of Influence
White	264,599	87,296	193,250	545,145
Black	1,618	135	1,258	3,011
American Indian, Eskimo, and Aleut				
American Indian	2,382	723	1,923	5,028
Eskimo	43	11	37	91
Aleut	46	8	17	71
Asian and Pacific Islander				
Japanese	796	78	328	1,202
Chinese	798	107	307	1,212
Filipino	278	58	298	634
Korean	383	112	159	654
Asian Indian	203	22	12	337
Vietnamese	204	49	612	865
Hawaiian	177	35	122	334
Guamanian	60	12	16	88
Samoan	29	1	21	51
Other	3,619	848	6,232	10,699
TOTAL PERSONS	275,235	89,495	204,629	569,422

Source: U.S. Census, Summary Tape File 1A.

Native Americans

Lane County had the largest number of Native Americans (2,382), with Marion County following closely with 1,923 persons claiming American Indian descent (see Figure III-Y-4). Linn County had about one-half that amount, while the other secondary counties, except Douglas, had even less. Douglas

County, with 1,093 American Indians, has two Native American tribes; the Cow Creek Band of Umpqua Indians, recognized in 1982; and the newly recognized Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians, recognized in 1984. Deschutes County contains portions of the Confederated Tribes of the Warm Springs Indian Reservation.

Over 55% of American Indians in Lane County resided in the urbanized areas of Eugene-Springfield, with another 7% reported living the cities of Cottage Grove, Junction City, and Oakridge. The remaining live in smaller communities and in rural areas. In Marion County, only about 3% live in the Silverton, Stayton, and Woodburn areas, but many more live in the suburban areas around Salem. For the American Indians in Linn County, about 60% live in the Albany, Lebanon, and Sweet Home areas.

The Warm Springs Confederated Tribe is the only federally recognized Native American group that have traditional ties in the Forest. The Confederated Tribe resides on the Warm Springs Indian Reservation in Central Oregon. The western boundary of the reservation is, in part, the eastern boundary of the Forest along the crest of the Cascade Range. The tribe has traditionally used the high alpine areas on the Forest for centuries.

ECONOMIC ENVIRONMENT

Oregon Economy

Gross Product Value - Oregon has historically been dependent on its manufacturing sector as an economic base. Although the State's economy is gradually becoming more diversified industries based on production still dominate with a gross product value of 10.92 billion. Despite the 1981-1982 recession, the lumber and wood products industry is still the largest component of the manufacturing sector with a 1986 gross product value of 2.49 billion. Gross product value (or gross state product) is the value of the final output of all goods and services produced. Other major groupings and their 1986 gross product values are: producer services - 9.54 billion; distributive - 9.17 billion; government - 5.04 billion; social services - 2.85 billion; personal services - 2.08 billion; and extractive - 1.69 billion.

Oregon has traditionally depended on its natural resources as a major source of employment, income, and wealth; however, this industry has declined and is likely to continue to decline over the next decade. The gross product value of the lumber and wood products industry peaked at 2.98 billion in 1979. The national recession caused three years of decline to a low of 1.77 billion in 1982. The gross product value began rising again when the recovery started in 1983 but has not continued a steady growth.

Producer and social service sectors are the fastest growing in the state. Social services has more than doubled from 1.16 billion in 1977 to 2.85 billion in 1986. Producer services replaced at a similar rate of increase from 3.92 billion in 1977 to 9.54 billion in 1986. The transformative category including manufacturing, construction and utilities had the slowest growth of only 49% in the last decade. These figures point towards an economy shifting from a manufacturing base to a service-oriented economy.

The gross product value of the distributive category steadily increased during the last decade experiencing only a small decline during the recession. Overall this category experienced a 90% growth and is now the third largest industry in the state.

The extractive classification which is predominately agriculture is the smallest industry in terms of gross cash receipts. The total value of agricultural production has increased steadily during the 1980s. Values for 1982 through 1983 were lower than the $1.47 billion of 1980 because of lower commodity prices for many crops.

Much of the income associated with agriculture goes to purchases in other industrial sectors (e.g., farm machinery) rather than to labor. Employment in agriculture has been declining due to mechanization and the switch to less labor-intensive crops.

While agriculture is very important to the economy of the sparsely populated east side of the State, the most economically significant area in the State is the agriculturally diversified Willamette Valley. It produced about 40% of Oregon's agricultural product cash income in 1982. In 1984, Marion, Linn, and Lane counties ranked first, seventh, and tenth, respectively, in gross farm sales for Oregon counties. These three counties had $350 million in sales or about 20% of the state total.

The recession of the early 1980s either slowed or reversed established growth trends for many of the state's major industries. The sustained recovery that the nation has been experiencing since 1983 is reversing this decline. Figure III-Y-5 displays recent trends in gross product value for major industries of the state.

Table III-Y-5. Oregon Gross Product Value [1]

Year	Lumber and Wood Products [2]	Tourism and Travel [3]	Farming and Food Processing	Transportation	Construction	High Technology [4]
1983	2.88	1.56	1.97	1.33	1.08	1.39
1982	2.30	1.41	1.87	1.22	1.07	1.42
1981	2.54	1.27	1.89	1.24	1.31	1.39
1980	2.90	0.84	1.93	1.21	1.59	1.27
1979	3.22	0.79	1.61	1.12	1.65	1.07
1978	2.97	0.73	1.38	1.01	1.41	0.88
1977	2.57	0.51	1.09	0.89	1.15	0.70
1976	2.20	0.44	1.15	0.78	0.93	0.55
1975	1.71	0.50	1.14	0.67	0.80	0.48
1970	1.15	0.27	0.64	0.45	0.46	0.28
1965	0.86	0.18	0.48	0.36	0.40	0.16
1960	0.63	0.15	0.45	0.26	0.26	0.09

Oregon: A Statistical Profile, Oregon Economic Development Department, April, 1985.

[1]Billions of Current Dollars
[2]Includes paper and allied products.
[3]Includes out-of-state vacationers only. Other travelers not included.
[4]Includes Machinery, Electrical equipment and instruments. Not all machinery is in the high technology industries but is included here.

Employment - The gradual diversification of Oregon's economy is the result of two major shifts which are best seen through trends in the state's employment. The first is a change within the manufacturing sector. The lumber and wood products industry no longer dominates manufacturing employment to the extent it once did.

Despite high harvest levels in 1985, employment in the wood products industry declined. Increased productivity, automation, and a desire to reduce costs is in part an explanation to a trend that began two decades ago and accelerated during the recession.

Technological advances towards automation have significantly reduced the amount of labor required to process given amounts of timber. In sawmills and planing mills, it took about eight employees to

process a million board feet of timber in 1950. By 1979, only 4.5 employees were needed to process the same amount and in 1984 this was down to 3.4 employees.

In addition to technological advances substantial reductions in employment occurred during the recession as many older and less cost efficient mills closed. From 1980 to 1985 approximately 60 mills have closed in Oregon and have not reopened.

Over 16,000 timber industry jobs have been lost as a result of these changes. Despite having fewer mills with fewer workers, almost as much wood was processed in Oregon in 1985 as in the peak year of 1979. This indicates that most, if not all, of these jobs will never be recovered.

Other manufacturing industries have increased in importance as the timber industry has declined. Employment in high technology and metals increased dramatically in the 1960s and 1970s. The combined employment of these industries exceeded that of the lumber and wood products industry in 1989.

The growth and diversification in the manufacturing sector has not been uniform across the state. Much of it has been occurring in the Portland metropolitan counties. The rest of the state remains heavily dependent on wood products for its manufacturing employment. Figure III-Y-6 shows the percent distribution of state employment for major manufacturing sectors.

The second major change occurring in the Oregon economy is the shift from a manufacturing based economy to a nonmanufacturing or service-oriented economy. The nonmanufacturing component of nonagricultural employment has risen rapidly and been affected less by recessions than manufacturing employment. Between 1970 and 1980 manufacturing employment increased by about 25% compared to 60% for nonmanufacturing. This trend continued from 1980 to 1989 with manufacturing employment increasing by only 1% as compared to a 24% increase in nonmanufacturing. Figure III-Y-7 shows employment and percent of total for major sectors of the state's economy since 1960.

Figure III-Y-6. Oregon Manufacturing Employment

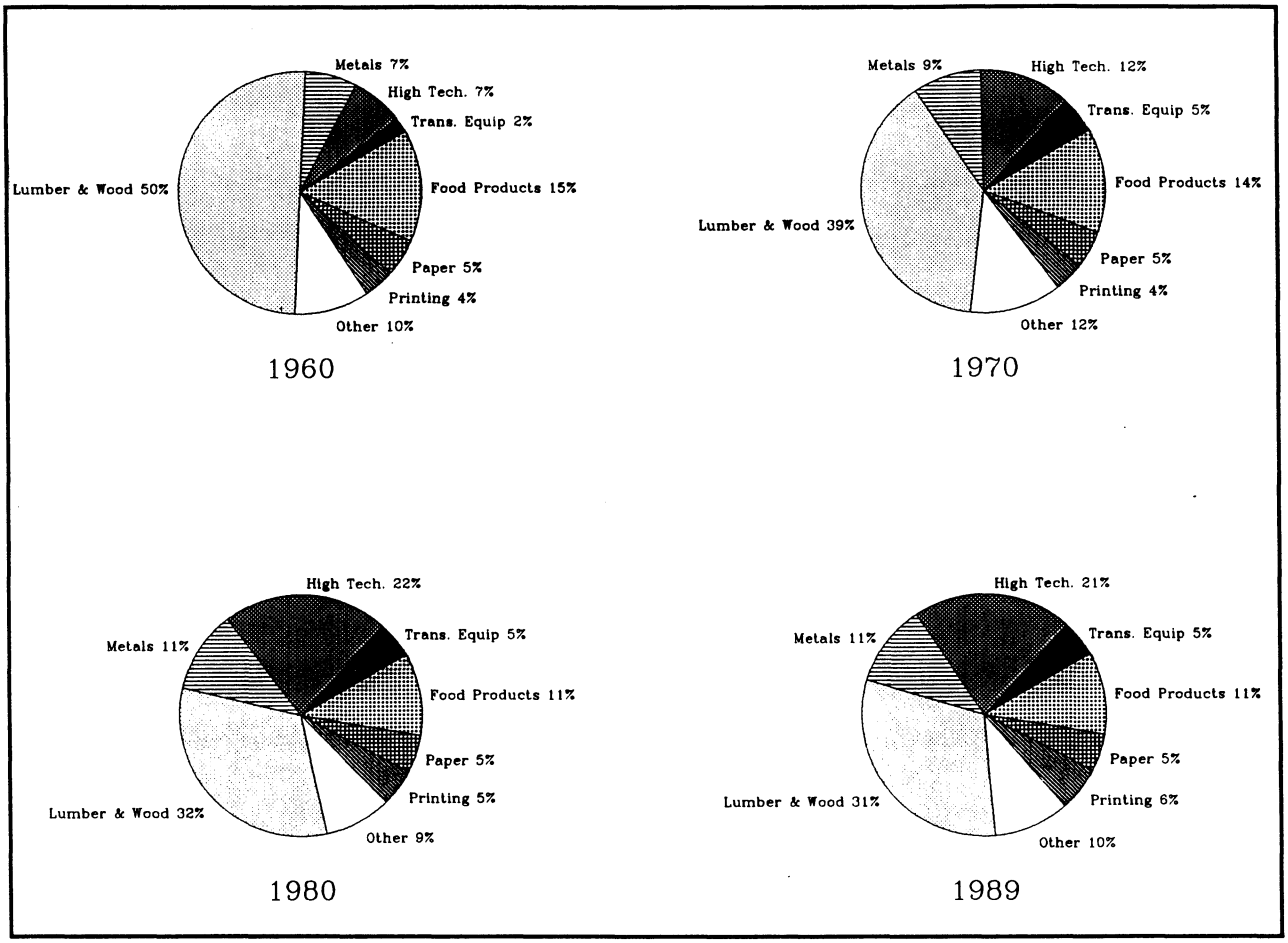
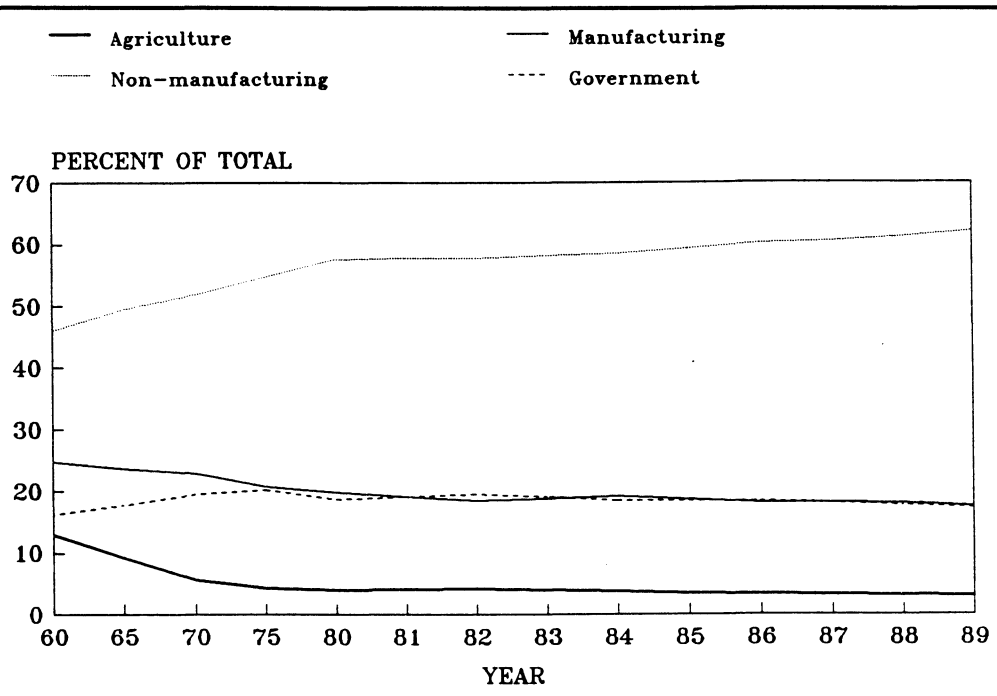


Table III-Y-7. Oregon Employment by Major Sector [1]



		Agriculture		Manufacturing		Non-Manufacturing		Government	
Year	Total	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
1989[1]	1,244.0	37.3	3.0	217.2	17.5	774.3	62.2	215.2	17.3
1988	1,193.1	37.1	3.1	214.2	18.0	730.6	61.2	211.2	17.7
1987	1,137.3	37.2	3.3	206.2	18.1	688.3	60.5	205.6	18.1
1986	1,096.2	37.7	3.4	198.4	18.1	659.9	60.2	200.2	18.3
1985	1,067.6	37.6	3.5	199.3	18.7	633.0	59.3	197.7	18.5
1984	1,046.4	39.5	3.8	201.1	19.2	611.7	58.5	194.1	18.5
1983	1,006.9	40.2	4.0	188.8	18.8	585.6	58.2	192.3	19.1
1982	1,002.9	42.1	4.2	185.7	18.5	579.6	57.8	195.5	19.5
1981	1,061.5	43.1	4.1	202.7	19.1	613.1	57.8	202.6	19.1
1980	1,087.6	43.0	4.0	215.1	19.8	626.3	57.6	203.2	18.7
1975	874.7	37.3	4.3	182.1	20.8	478.2	54.7	177.1	20.2
1970	751.7	42.5	5.7	172.3	22.9	390.2	51.9	146.7	19.5
1965	669.0	61.6	9.2	158.2	23.6	331.0	49.5	118.2	17.7
1960	585.4	76.2	13.0	144.4	24.7	269.5	46.0	95.3	16.3

[1]Amount (in Thousands) and Percent of Total.
[2]1989 data are preliminary estimates

Sources: *Oregon: A Statistical Profile,* Oregon Economic Development Department, April 1985.
"Oregon Labor Trends," Employment Division, Oregon Department of Human Resources, February, 1986.
Employment Division, Oregon Department of Human Resources, February, 1989.

Economy of the Primary Area of Influence

Overview - The industries which are important to the State of Oregon are also important to the three counties which represent the Forest's primary area of influence. The impact the Forest has on the health and stability of these industries, however, varies considerably.

All three counties have a significant part of their manufacturing-based labor force in the lumber and wood products industry. Lane, Linn, and Marion county mills processed about 826 million board feet of timber from the national forest land or about 27% of the state's total in 1985. Over 75% of this was harvested from the Forest; consequently, changes in the amount of timber offered for sale by the Forest can affect a large number of people.

The direct effects are felt primarily in communities with lumber and wood products companies. Indirect effects are felt in other sectors over a much wider area. Employment and income in the service, trade, transportation, and other sectors throughout Western Oregon are linked to the lumber and wood products industry. Moderate-to-large changes in timber sale levels by the Willamette will affect these industries.

Other major industries are indirectly affected by changes in Forest management. The agriculture and food processing industries are very important to Lane, Linn, and Marion counties. Management of the Forest, however, has little effect on these industries. Demand for domestic livestock forage from the Forest is expected to remain virtually nonexistent, even though the Forest has some good grazing potential. Commercial fisheries are affected somewhat by changes to fish habitat on the Forest, but these effects occur in the counties along the Lower Columbia River and not in the primary area of influence. Thus, despite being very important to the overall economy in the three-county area, employment and income in the agriculture and food processing industries is not directly affected by changes in Forest management.

Tourism is another major industry in the primary area of influence. Recreation-related trade and services are important to the smaller towns within or adjacent to Forest boundaries as well as to the larger cities in the southern and central Willamette Valley. The Forest provides many of the recreation opportunities that support the industry in this area.

Tourism is an "industry" in the sense that it is a reason for economic activity to occur. The employment and income associated with or dependent on tourism and recreation is rather difficult to estimate. Unlike individual economic sectors such as lumber and wood products, tourism is composed of a broad spectrum of other industries. These include durable (e.g., recreation equipment) and nondurable (e.g., food products) manufacturing, wholesale and retail trade, transportation, and services. Historical information related to the many pieces of sectoral economic activity associated with tourism is generally not available. Thus, the discussion and data on employment and income in the three-county area will not deal directly with tourism as a separate or unique industry.

Employment - *Lane County* - Lane County is the largest county in the primary area of influence in terms of population and employment. It is the leading producer of lumber and wood products in Oregon. In 1985, its mills processed over 527 million board feet from the national forest land or 16% of the State's total. About 421 million board feet or 81% of this was harvested on the Willamette.

The structural changes occurring in the State's economy are also occurring in the economy of Lane County. A changing manufacturing base and a shift towards a more service-oriented economy are resulting in a gradual diversification in a county long dependent on the lumber and wood products industry.

Lumber and wood products employment in Lane County represented about 10% of the total nonagricultural wage and salary employment and about 53% of manufacturing employment in 1989. In 1972 these figures were about 20 and 74%, respectively.

This decline began before the 1981-1982 recession and reflects increased productivity per worker due to improvements in technology. Between 1972 and 1979 about 900 timber industry jobs were lost. The recession accelerated this job loss with about 3,800 jobs being lost between 1979 and 1982. As the economy improved over the next two years about 1,200 jobs were regained; however, pre-recession employment levels in this industry are not expected to return.

The most significant employment increases between 1980 and 1989 were in the service and trade sectors. Employment in services increased by 7,600 from 19,700 in 1980 to 27,300 in 1989. Trade employment experienced an increase of 3,400 jobs from 25,700 to 29,100 during this same period.

In the manufacturing sector employment in the nonlumber component increased by about 56% or about 1,900 jobs from 1980 to 1989. This reflects the slow diversification of the manufacturing sector. Figure III-Y-8 displays actual employment data by sector for a number of years between 1970 and 1989.

The Eugene/Springfield area is somewhat more diversified than the county as a whole. The area serves as a trade and service center for much of Western Oregon. The University of Oregon and Lane Community College in Eugene are also major employers which help put government employment in Lane County above the state average. In 1989 Lane County's government employment sector comprised 20% of the total nonagricultural wage and salary employment compared to 18% for the state.

Many of the outlying smaller communities are more dependent on wood products than the Eugene/Springfield urban area. While mills in some communities rely on wood from other suppliers, others get a substantial amount of their timber from the Forest.

Other communities, like those up Highway 126 along the McKenzie River, are dependent on recreation-related trade and services. The Forest supplies many of the opportunities which attract recreationists who spend money and support the businesses in these communities.

Table III-Y-8. Lane County - Nonagricultural Wage and Salary Employment

	Annual Average							
	1970	**1980**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
Manufacturing, Total	18,400	19,800	19,300	18,600	18,000	19,900	20,900	21,100
Durable Goods	15,400	16,300	15,300	14,600	13,900	15,500	16,500	16,500
Lumber & Wood	13,600	12,900	11,700	10,800	10,100	11,100	11,500	11,200
Other Durable	1,800	3,400	3,700	3,700	3,800	4,400	5,000	5,300
Nondurable Goods	3,000	3,500	4,000	4,100	4,100	4,300	4,400	4,600
Food Products	1,550	1,500	1,600	1,700	1,700	1,600	1,600	1,600
Other Nondurable	1,450	2,000	2,400	2,400	2,500	2,700	2,800	2,900
Nonmanufacturing, Total	51,250	83,100	76,900	78,300	81,200	85,200	88,900	93,700
Mining & Quarrying	0	0	200	200	200	200	200	200
Construction	2,950	4,600	2,800	2,900	2,900	3,300	3,400	3,900
Trans., Comm., & Utilities	4,150	5,100	4,300	4,300	4,100	4,200	4,300	4,400
Trade	14,650	25,700	24,600	24,700	25,500	26,600	27,800	29,100
Finance, Ins., & Real Estate	2,950	5,500	4,600	4,500	4,600	4,900	5,300	5,500
Services & Misc.	10,050	19,700	19,700	20,500	22,100	23,800	25,100	27,300
Government	16,500	22,500	20,900	21,200	21,800	22,300	23,000	23,200
Total Wage & Salary	69,650	102,900	96,300	96,900	99,200	105,100	109,800	114,800

Source: Employment Division, Department of Human Resources, State of Oregon.

Linn County - Linn County has the smallest population and is the most rural of the three counties in the primary area of influence. Its manufacturing sector has historically accounted for a higher proportion of its total employment than Lane County, but also has been less dominated by the lumber and wood products industry. In 1989 manufacturing employment accounted for almost 33% of total nonagricultural wage and salary employment. Employment in lumber and wood products industries accounted for about 41% of total manufacturing compared to 53% for Lane County in that same year.

Jobs provided in lumber and wood products declined overall by 19% from 5,200 in 1980 to 4,370 in 1989. The services and trade sectors again showed the largest employment increase. Employment and trade services increase 24% from 5,670 in 1980 to 7,010 in 1989. Employment in services increased 56% from 3,800 to 5,550 during the same period. Though, a shifting from manufacturing to a service oriented economy is taking place, lumber and wood sectors are still important to many of the communities in Linn county. Figure III-Y-9 displays actual employment data by sector for a number of years between 1970 and 1985.

Linn County mills processed over 113 million board feet of timber from national forest land in 1985 which was less than one quarter the amount processed in Lane County. About 80% of this came from the Forest. Some of the smaller communities closer to the Forest boundary are somewhat more dependent on the timber industry than the county overall. Both Lebanon and Sweet Home have a number of mills which employ a high percentage of the people in those communities.

Table III-Y-9. Linn County - Nonagricultural Wage and Salary Employment

	Annual Average							
	1970	**1980**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
Manufacturing, Total	9,340	11,070	10,140	9,730	9,630	10,410	10,410	10,790
Durable Goods	7,330	8,590	7,730	7,390	7,450	7,900	8,050	8,000
Lumber & Wood	4,730	5,200	4,940	4,370	4,430	4,780	4,650	4,370
Other Durable	2,600	3,390	2,790	3,020	3,020	3,110	3,390	3,630
Nondurable Goods	2,010	2,480	2,410	2,340	2,180	2,240	2,370	2,790
Food Products	970	1,120	1,020	880	740	750	800	990
Other Nondurable	1,040	1,360	1,390	1,470	1,440	1,500	1,570	1,790
Nonmanufacturing, Total	11,630	19,500	17,910	18,170	18,930	19,430	20,760	22,070
Construction	990	1,390	840	910	880	910	980	1,110
Trans., Comm., & Utilities	1,010	1,360	1,260	1,320	1,340	1,370	1,380	1,430
Trade	3,480	5,670	5,390	5,730	6,070	6,020	6,470	7,010
Finance, Ins., & Real Estate	720	1,290	1,230	1,140	1,200	1,040	1,020	1,060
Services & Misc.	2,290	3,800	3,940	3,990	4,220	4,760	5,490	5,910
Government	3,140	5,990	5,250	5,070	5,230	5,310	5,420	5,550
Total Wage & Salary	20,970	30,570	28,050	27,900	28,560	29,570	31,180	32,860

Source: Employment Division, Department of Human Resources, State of Oregon.

Marion County - Marion and Polk counties make up the Salem Metropolitan Statistical Area (MSA). Marion County residents account for approximately 82% of the MSA population. Employment in the MSA is dominated by the government sector which employed over 27,800 people in 1989. More than half of these government workers are employed by the State and work in Salem, the State capital.

Manufacturing employment in the MSA is very small. It accounts for about 15% of total nonagricultural wage and salary employment. Employment in the lumber and wood products industry increased steadily from 1984 to 1988 providing an additional 800 jobs. Slightly less than 192 million board feet of timber was processed in Marion and Polk County mills in 1985. About 56% of this came from the Forest.

Along Highway 22 in the North Santiam Canyon lie the small incorporated cities of Stayton, Mill City, Gates, Detroit, and Idanha. These communities are much more dependent on the lumber and wood products industry than the Salem metropolitan area. Several mills are located in these communities.

Recreation-related trade and services are also important to the North Santiam communities. Many retirees are moving to the area and Highway 22 is a major travel route between Salem and central Oregon.

Figure III-Y-10 displays actual employment data by sector for Salem MSA for a number of years between 1970 and 1989.

Table III-Y-10. Salem MSA - Nonagricultural Wage and Salary Employment

	Annual Average							
	1970	**1980**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
Manufacturing, Total	10,600	14,300	13,100	13,400	13,500	14,500	15,300	15,600
Durable Goods	4,600	6,800	6,500	6,700	6,900	7,400	8,100	8,200
Lumber & Wood	2,400	3,500	3,100	3,200	3,500	3,800	3,900	3,800
Other Durable	2,200	3,300	3,400	3,500	3,500	3,600	4,200	4,400
Nondurable Goods	6,000	7,500	6,600	6,700	6,600	7,100	7,300	7,400
Food Products	4,000	5,000	4,700	4,800	4,500	4,900	4,800	4,900
Other Nondurable	2,000	2,500	1,900	2,000	2,100	2,300	2,500	2,500
Nonmanufacturing, Total	44,600	74,000	72,100	75,300	77,500	82,000	86,100	88,900
Mining & Quarrying	0	0	100	100	100	100	100	100
Construction	2,600	4,200	2,600	2,900	3,000	3,200	3,500	4,100
Trans., Comm., & Utilities	1,900	2,800	2,500	2,500	2,700	2,900	2,900	2,800
Trade	11,300	19,200	19,300	20,200	20,600	21,600	22,800	23,500
Finance, Ins., & Real Estate	3,100	5,600	5,200	5,000	5,300	5,500	5,600	5,400
Services & Misc.	7,900	14,800	15,700	16,600	17,800	19,100	20,800	22,000
Government	17,800	27,400	26,700	28,000	28,100	29,700	30,500	31,100
Total Wage & Salary	55,200	88,300	85,200	88,700	91,000	96,500	101,500	104,500

Source: Employment Division, Department of Human Resources, State of Oregon.

Personal Income - Income and wage data are other indicators of the relative health of an economy. Several types of income-related data can be used to compare areas or changes over time. These include total personal income, median family income, per capita income, covered payroll, average hourly earnings, poverty rates, and common wage rates. This discussion will focus on total personal and per capita income. Total personal income is a measure which will be used to compare land management planning alternatives. Most of the other indicators are discussed in the Forest's Socio-Economic Overview.

Total personal income is the income of local residents from all sources before taxes and Social Security are withheld. Per capita income is total personal income divided by the total population of the area.

Total and per capita personal income in Oregon and the three-county area have risen steadily since the recession of 1981-1982. Total personal income in both Oregon and in the primary area of influence increased 35% between 1980 and 1989. All components of total personal income, however, have not increased at the same rate.

Personal income for the three-county area lags behind that of the state and the nation when measured on a per capita basis. Per capita income exceeded the national average in the late 1970's but was hit so hard during the recession that it still lanquishes 8% below the national average. Explanation of the lag in per capita income when compared to the state and the nation can be explained in part by the effects on unemployment of the 1981-1982 recession on the local economies which are structured somewhat differently than the state and national economies. Many of the jobs lost in Lane and Linn counties were in the construction and lumber and wood products industries which are generally

higher-paying jobs. Marion County was not affected as much because it has a lower proportion of its workforce in the industries hardest hit by the recession. It also has a large number of moderate to high-paying jobs in the government sector.

The rate of increase between the counties and the U.S. have remained fairly consistent. Between 1982 and 1989, per capita income increased by 37, 30, and 31% in Lane, Linn, and Marion counties, respectively, 32% in Oregon, and approximately 33% in the nation.

A review of earned personal income (i.e., total income less dividends, interest, rent, and transfer payments) by sector gives an indication of the industries which contribute the most to the personal income of an economy. In Lane County durable goods manufacturing, services, and government each accounted for about 18, 24, 18% of total earned personal income in 1987, respectively. Most of the durable goods manufacturing comes from the lumber and wood products industry. Retail trade was the only other sector accounting for more than 12%.

The pattern is somewhat different in Linn and Marion counties, however. Durable goods manufacturing accounted for 31% of Linn County's earned personal income in 1987. This came primarily from the lumber and wood products industry and primary metals manufacturing. The service and government sector were the only other sectors accounting for more than 12% of the total.

The two sectors which provided over half of Marion County's earned income in 1983 are government with 30% and services with 21%. Marion County has a relatively small durable goods manufacturing base accounting for only 7% of the total personal income.

The distribution of earned personal income for Lane County most closely approximates that of the state. Over 54% of Oregon's personal income is derived from the durable goods manufacturing (16.1%), services (22.3%), and government (16.3%) sectors. Figure III-Y-11 compares the 1983 earnings by industry for Lane, Linn, and Marion counties and the State of Oregon.

An examination of earned personal income by industry over time also gives an indication of how county economies are changing. The 1981-1982 recession had somewhat similar effects on Lane and Linn counties. In both cases the percentage of total income in durable goods manufacturing declined between 1982 and 1987 while the proportion in services increased. Some of this change could be due to the gradual trend towards economic diversification occurring in these counties.

The proportion of income derived from major sectors did not change significantly in Marion County during this time period. A minor shift away from nondurable goods manufacturing and government towards services did occur. Shifts within major sectors such as durable goods manufacturing may also have occurred.

Table III-Y-11. Total Earnings by Sector, 1987 [1]

	Lane County		Linn County		Marion County		Oregon	
Economic Sector	MM$	% of Total	MM$	% of Total	MM$	% of Total	MM$	% of Total
Farming	37.6	1.5	50.0	6.4	90.0	4.7	920.0	3.4
Mining	6.6	0.3	0.7	0.0	4.0	0.2	63.1	0.2
Construction	131.6	5.4	33.4	4.3	105.9	5.5	1,399.0	5.1
Manufacturing	546.7	22.4	318.4	40.5	253.2	13.1	5,833.0	21.4
Transportation and Utilities	142.6	5.8	52.2	6.6	82.5	4.3	2,038.5	7.5
Wholesale Trade	143.2	5.9	26.7	3.4	86.0	4.5	1,861.0	6.8
Retail Trade	301.0	12.3	66.4	8.5	207.4	10.7	2,908.0	10.7
F.I.R.E. [2]	81.1	3.3	15.0	1.9	95.8	5.0	1,412.2	5.2
Services	583.4	23.9	115.7	14.7	410.2	21.2	6,088.0	22.3
Government	441.3	18.1	99.8	12.7	576.2	29.8	4,443.1	16.3
Other [3]	27.0	1.1	7.0	0.9	19.6	1.0	284.0	1.0
TOTAL	2,442.1	100.0	785.3	100.0	1,930.8	100.0	27,249.9	100.0

[1]Total personal income less dividends, interest, rent, and transfer payments in millions of dollars.
[2]Finance, Insurance, and Real Estate.
[3]Agriculture Services, Forestry, Fisheries, and International Organizations.

Source: Employment Division, Department of Human Resources, State of Oregon.

Finally, a comparison of the percentage of income derived from an industry and the percentage of employment associated with it gives an indication of wage levels and the relative employment and income impacts which might be expected from the analysis of Forest plan alternatives. An examination of Lane, Linn, and Marion county data shows that the percentage of total employment in manufacturing, construction, and transportation, communications, and utilities is lower than the percentage of total income. This indicates that these industries tend to have higher paying jobs.

The opposite is for the trade sector. The percent of employment in this sector tends to be higher than the percentage of total income generated. This is a reflection of the generally lower average pay associated with jobs in this sector.

Payments to Counties - Counties having National Forest land within their boundaries receive a portion of the revenues taken in by the Forest from the use of the land or sale of its resources. The distribution of payments to counties occurs in one of two ways. National Forest System lands money that is returned to the federal treasury 25% is distributed to counties based on the amount of National Forest land within their boundaries. These funds are earmarked for schools (25%) and roads (75%).

On Oregon and California (O&C) Railroad grant lands, 50% of the money paid to the Federal Treasury is returned to the Bureau of Land Management for distribution to the counties having these lands.

Revenues from the Forest are derived primarily from the harvest of timber. Over 99% of the Forest's revenues came from this source. Other revenues came from recreation user fees and permits for special uses, grazing, minerals, power, and other land uses.

The "25% funds" from National Forest system lands on the Willamette are divided among six counties: Clackamas, Douglas, Jefferson, Lane, Linn, and Marion. Almost 97% of the money returned goes to the three counties which make up the Forest's primary area of influence: Lane, 60%; Linn 29%; and, Marion 8%. About 3% goes to Douglas County and less than 1% to the other two counties combined.

Revenue from O&C Lands administered by the Forest averaged less than 5% of total timber revenues between 1979 and 1985. The Forest contains over 51,000 acres of O&C Lands or about 3% of its total landbase. Most (99%) of these are in Lane County.

Revenues returned to counties from National Forest land play an important part in county and school district budgets. A 1979 study found that revenues from all the National Forests accounted for an average of 17.4% of all the Oregon counties revenues in fiscal year 1977-1978. This represented a 50% increase over 1968-1969.

Dependency on revenues from any one source can be a problem if that source is subject to unpredictable short-term changes. This has been the case with Forest revenues that are predominantly dependent on the market for timber.

Forest revenues peaked in 1979 when both the volume harvested and the price of timber were high. Prices and volume harvested fell significantly during the 1981-1982 recession, but have recently regained strength with prices approaching the 1980 highs and the third harvest level in 1988 bringing 1/3 higher receipts than the highest previous harvest in 1979.

Receipts rose slowly in 1983 and 1984 and took a relatively large jump in 1985 and again in 1987 as the economic recovery finally reached the wood products industry in Oregon. Most of these increases were due to increases in the amount harvested, not increases in prices. Only recently have prices begun to increase above recessionary levels. From 1987 to 1988 there was a 23% increase in revenues with a corresponding increase in prices and a in volume harvested.

Figure III-Y-12 displays Forest revenues for 1979 through 1989 and their distribution to counties.

As long as payments to counties are linked to volume harvested they will be subject to periodic fluctuations. The relationship between timber prices and harvest levels is an important one affecting both total revenues and payments to counties. While it would appear to be in the interest of local counties to have high prices for National Forest timber, high prices can discourage harvest activity and result in less revenue. Low timber prices encourage harvest activity and may increase payments to counties more than rising prices would.

Timber prices are affected by a variety of factors at the local, regional, and national levels. The Forest's sale quantity, the supply from other producers, and national demand will all affect total revenues and payments to counties.

Table III-Y-12. Forest Revenues [1]

	Fiscal Year						
National Forest Fund (NFF)	**1979**	**1981**	**1983**	**1985**	**1987**	**1988**	**1989**
Timber (Net Stumpage)	93,971.6	65,368.7	39,567.1	63,903.9	94,917.5	117,493.2	122,542.0
Grazing	0.0	0.5	0.4	0.4	0.5	0.5	0.7
Recreation Special Uses	65.1	59.7	93.3	73.0	185.8	214.5	223.3
Recreation User Fees	59.9	78.4	98.9	141.3	109.1	134.5	182.5
Land Uses	7.2	7.2	9.2	17.9	21.0	18.0	22.0
Power	0.1	0.1	0.2	0.8	0.4	2.1	0.9
Minerals	5.6	3.2	8.0	36.4	3.8	6.5	10.2
SUBTOTAL	94,109.5	65,517.8	39,777.0	64,173.7	95,238.1	117,869.3	122,981.6
K-V [2] Collections	5,562.6	6,559.7	10,145.2	13,450.3	6,172.0	11,015.8	12,461.8
Purchaser Road Credits	10,859.4	15,267.3	14,207.4	9,392.0	11,047.3	10,171.6	9,563.3
TOTAL NFF RECEIPTS [3]	110,531.5	87,344.8	63,936.5	87,016.0	112,457.4	139,056.7	145,006.7
O&C Receipts [4]	8,441.0	3,523.4	3,130.9	2,821.6	6,410.3	7,579.9	6,636.0
	Distribution of NFF Receipts by County [5]						
Clackamas	13.8	10.9	8.0	10.9	15.7	18.1	21.1
Douglas	856.6	676.9	495.5	674.4	921.6	1,065.4	1,240.6
Jefferson	11.1	8.7	6.4	8.7	11.6	13.4	15.6
Lane	16,521.7	13,055.9	9,556.9	13,006.7	17,784.0	20,581.9	23,965.2
Linn	7,930.6	6,267.0	4,587.4	6,243.4	8,522.5	9,868.0	11,490.7
Marion	2,299.1	1,816.8	1,329.9	1,809.9	2,476.0	2,867.5	3,339.1
TOTAL	27,632.9	21,836.2	15,984.1	21,754.0	29,731.4	34,414.3	40,072.3

[1]Revenues in thousands of dollars.
[2]Knutson-Vandenberg.
[3]25 percent of these funds are returned to counties.
[4]50 percent of these funds are returned to counties by the Bureau of Land Management.
[5]Distribution of National Forest Fund (NFF) funds is based on the percent of total Forest acreage in each county.
[6]Fiscal year 1987 timber receipts incluse $965,211.35 in timber buyout receipts.

Other Influenced Areas

Some counties outside the Forest's primary area of influence are affected, though to an lesser extent, by management of the resources on the Forest. A brief discussion of the relationship of the Forest to some of these counties follows.

Clatsop and Columbia counties, located at the mouth of the Columbia River in northwest Oregon, are affected by the management of fish habitat on the Forest. Their economies are impacted by production levels of spring chinook salmon on the Forest. Up to 75% of the fish taken during the short spring chinook gillnetting season may have originated in the rivers and streams of the Forest.

These counties are lightly populated, although Columbia County is becoming more attractive to Portland commuters. The economies of both counties depend on agriculture, wood products, and paper. Fishing, seafood processing, and tourism are also important to Clatsop County. Although tourism continues to do well, wood products, seafood processing, and fishing have been declining.

Benton County is lightly populated, but growing. It has one of the more stable economies in Western Oregon. While wood products are important, the biggest employers are not wood products firms, but rather Oregon State University and Hewlett-Packard. Agriculture is also important.

People of Benton County have been strongly represented among the Forest's recreation users, especially in Wilderness use. Unlike Portland area people who can easily visit the Mt. Hood National Forest, Benton County backpackers find that the closest high altitude country is on the Willamette.

Douglas County mills have bought a small portion of Forest timber. The county has been rapidly growing, but still remains lightly populated. Over one-third of its people live in and around the Roseburg urban area. Douglas County is one of the most (if not *the* most) timber-dependent counties in Oregon; over four-fifths of its manufacturing sector employment is in lumber and wood products. In addition, its nonmanufacturing sector is relatively small. During the recession of the past few years, it has had one of the highest unemployment rates in Oregon.

NONNATIONAL FOREST LAND

This section discusses the relationships between National Forest land and lands of other ownerships. This includes parcels of nonnational forest land surrounded by National Forest, and parcels of National Forest lands surrounded by land of other ownerships.

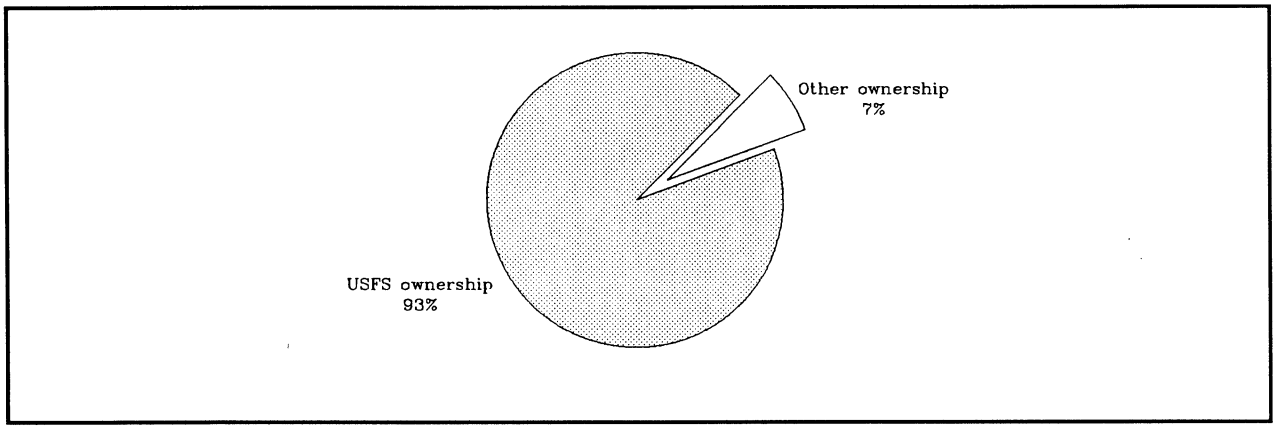
Current And Historic Conditions

Land Ownership Status

There is a variety of land ownership patterns within the proclamation boundary of the Forest. These patterns include unbroken federal ownership, attributable to early Forest Reserve set-asides; checker-board patterns, resulting from land grants made for the construction of railroads and wagon roads; and a mixed mosaic of ownerships, resulting from homestead and mining claim patents; other public land laws which made public domain lands available to the public for acquisition; and blocks of private land resulting from land exchanges.

Most of the Forest is in unbroken federal ownership. Although there are areas where management complexity is increased due to the ownership pattern, the overall impact of the ownership pattern on Forest management is low when compared to other units in the National Forest System. Figure III-Z-1 displays land ownership distribution within the Forest.

Figure III-Z-1. Land Ownership on the Forest



The Corps of Engineers, Bureau of Land Management, and the State of Oregon administer or own land within or adjacent to the Forest. The incorporated communities of Idanha, Detroit, Oakridge, and Westfir are within the exterior boundaries of the Forest. In addition, there are several smaller settlements which are unincorporated.

There are eight major owners of private lands within the Forest boundary: Willamette Industries Incorporated, Weyerhauser Company, Champion International Corporation, Pope and Talbot, Giustina Brothers Lumber and Plywood Company; Young and Morgan, Timber Services Incorporated,and Hill Family Interest.

The management of included or adjacent private land is occasionally encumbered by the need for access across National Forest land. Other landowners may be affected by management activities on the Forest, such as timber harvest and road construction.

Adjacent private ownerships may impact the National Forest through various types of trespass and increased risk of wildfires. Management activities require a coordinated approach to maintain resource values.

Ownership Adjustments

Past adjustments have been made by donations, purchases, interchanges and exchanges. The Oregon and California (O&C) Lands Exchange Act (53 Stat. 1144), July 31, 1939, and Public Law 426 (68 Stat. 170), June 24, 1954 blocked up some Forest ownership by adding over 51,000 acres. Through Fiscal Year 1982, the Forest obtained approximately 60,000 more acres through the other various acquisition methods.

The primary objective of land ownership adjustments on the Forest is to simplify management problems and help improve multiple use management of all lands within the Forest (USDA 1969). High priority is placed on improving efficiency in administering the Forest; protecting and enhancing environmental quality, and maintaining and improving land and resource productivity.

The current land adjustment action plan provides for the consolidation of ownerships, through the acquisition of small parcels of interior private lands and disposal of small isolated parcel of National Forest System lands. In addition, it provides for acquiring lands and rights-of-way needed for administrative improvements and lands with high recreation potential.

Rights-of-way Acquisition and Grants

Existing ownership patterns often require reciprocal granting of rights-of-way for access roads, tail holds, landings, and flyways for timber harvest activities. Special use permits and leases for numerous public utilities, businesses, and community uses of National Forest lands are complicated by these intermingled ownerships. Maintaining visual, fish, wildlife, and water quality management objectives is complicated by mixed ownership of habitats, watersheds, and viewsheds.

There are seven areas on the Forest where the major landowners have agreed to share the cost of construction, maintenance, and operation of a single road system across both private and National Forest lands for the mutual benefit of the landowners. In 1984, there were 136 supplements covering approximately 507 constructed road miles and 77 road miles to be constructed with cooperators in share-cost agreements.

Landowners not participating in share-cost agreement areas generally cooperate with the Forest Service in granting access to federal timber. There are approximately 388 existing rights-of-way acquired from nonshare-cost agreement landowners.

Access across National Forest lands is granted to cooperators and roading authorities by permanent and temporary easements, or special use permits, and is granted to others only through the special use permit process. There are approximately 120 easements existing on the Forest.

Future Trends

The future workload in land adjustments on the Forest could become increased somewhat over that at present. As the commercial timber is harvested from private lands within the Forest boundary, some of these lands could become proposed for exchange by the owners. The extent to which this situation might occur would be affected, in part, by the economic situation related to the lumber industry in the Northwest.

There are other considerations that could affect the rate of activity in land adjustments on the Forest. These include the interchange proposal between the Forest Service and the Bureau of Land Management and the recent Congressionally designated Columbia River Gorge National Scenic Area. The extent of the effects on land adjustment, if any, from these proposals is not clear at this time.

As the Forest development road system becomes completed, it is expected that the number of rights-of-way acquired will be less.

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

INTRODUCTION

This chapter provides the scientific and analytic basis for the comparison of alternatives presented in Chapter II. The narrative discusses reasons for and causes of environmental effects of the alternatives, and it presents the important interrelationships between resources, land uses, and environmental conditions.

Environmental consequences are discussed in the short- and long-term, and often by decade. Although a Forest Plan for any alternative would guide management for 10 to 15 years, effects beyond the first decade are also considered. This information helps to reveal long-term implications, and explores the potential for implementation of an alternative over time.

Like Chapter III, this chapter is organized by environmental component. The environmental consequences for each component affected by the alternatives are described in terms of direct effects, indirect effects, cumulative effects, relationships with other agencies policies or plans, and mitigation measures. Analysis of each environmental component involves some incomplete or unavailable information. A description of this information and how it was dealt with is provided.

NOTE TO READER

The following note applies to Figures which have an "NA" entry listed for Alternative NC, the No Change Altenative:

NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Forest FORPLAN model. Section D4b, of Chapter II in the Draft EIS describes these differences.

INCOMPLETE OR UNAVAILABLE INFORMATION

Some of the information used to predict environmental effects in this chapter is incomplete, while other information is unavailable at this time. Incomplete or unavailable information is noted later in this chapter for each major resource. The Forest has used the most current information available and state-of-the-art analytical tools to evaluate activities and to estimate effects.

The Council on Environmental Quality's NEPA regulations relating to incomplete or unavailable information have been amended (40 CFR 1502.22), amended at 51 Fed. Reg 15618 (April 25, 1986)). The following discussion complies with the amended regulations.

In the FEIS and Forest Plan:

- The discussions of the managment of the resources on the Forest have involved an evaluation of reasonably forseeable significant adverse effects on the human environment.

- The evaluation of those effects sometimes has been based upon information that is incomplete or only partially available.

- The incomplete or unavailable information cannot be obtained because the overall time and money costs to obtain the information would be exorbitant, and in many cases the means to obtain the information are not known.

Consequently, pursuant to 40 CFR 150.22(b), as amended, the following discussions of management impacts soil, water, air, vegetation, climate, fish, wildlife, artifacts and sites, recreation, scenery, Wild and Scenic rivers, Wilderness, Roadless lands, special interest areas and national natural landmarks, research natural areas and H.J. Andrews Experimental Forest, transportation system, minerals and energy, and social and economic setting include a description of the incomplete or unavailable information which is relavent to the evaluation of reasonably foreseeable significant adverse impacts associated with the alternatives.

CHANGES BETWEEN DRAFT AND FINAL

Changes were made to Chapter IV between the DEIS and this EIS in response to concerns expressed during the public comment period and as a result of newer information becoming available. The major changes are.

- The format of Chapter IV was revised to reflect major resource areas rather than programs or outputs. Specifically, discussions of effects on vegetation include timber, old growth, plant diversity, riparian, and range. Fire is discussed as it effects resouces not as a resource area.

- The discussion of old growth resources has been expanded, and the effects on existing old growth acres has been updated based on new information obtained from the Mature and Over Mature vegetation survey.

- The discussion on diversity has been expanded and is addressed in Vegetation (plant diversity) and in Wildlife (vertebrate diversity).

- Incorporated into the analysis of effects, the Regional FEIS for Managing Competing and Unwanted Vegetation.

- Updated the discussion on effects to spotted owls and spotted owl habitat to reflect the July, 1988 Supplement to the Environmental Impact Statement for an Amendment to the Pacific Northwest Regional Guide.

- The analysis of current condition and effects of the alternatives on mature and old growth forest Management Indicator Species (MIS) has been updated to reflect the impacts of forest fragmentation on habitat capability.

- The habitat requirements for primary cavity excavators have been revised based on Chapter 7, *Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington* (Brown 1985), and they are been included in the analysis of effects to potential populations.

- The habitat capability model used to predict deer and elk numbers and habitat conditions has been revised. *A Model to Evaluate Elk Habitat in Western Oregon* (Wisdom et al. 1986) was used in this FEIS. Indexes used to estimate potential populations are based habitat effectiveness values were developed in cooperation with the Oregon Department of Fish and Wildlife.

- Included information on newly designated Wild and Scenic rivers, and on eligibility studies on potential wild and scenic rivers.

- Extensive changes were made to the analysis of the risk of cumulative effects between the DEIS and FEIS, in response to substantative public comments. The FEIS considered three watershed characteristics in assigning Watershed Risk, erosion levels, hydrological recovery, and riparian condition; the DEIS considered only the first two components. The terminology used to describe the risk of watershed effects was changed to "High", "Medium" and "Low" from "Probable", "Possible", and "Unlikely", as part of the revised analysis method.

- The FORPLAN model used for the FEIS included watersheds (averaging 54,000 acres) as building blocks, which permitted analysis of the timber harvest levels prescribed by FORPLAN to be analyzed, rather than assuming that harvest was distributed evenly across all watersheds as was done in the DEIS. In FORPLAN, the relative sensitivity of watersheds to increases in peak flows was identified, and FORPLAN was programmed to distribute the harvest according to watershed sensitivity in all alternatives, to minimize the risk from increase peak flows.

- In Alternative W (PA), the sensitivity of smaller subdrainage areas (average 3900 acres) was described, and the level of harvest which would be compatible with maintaining stream channel stability in each subdrainage was estimated. This information was included in FORPLAN modelling.

- The analysis of potential sediment was changed to focus more on the potential sediment from mass movement, specifically debris slides in the FEIS. The potential sediment yields and discussion of effects in the DEIS included calculations of surface erosion. Studies have shown that a very small portion of surface erosion reach streams, lakes, or wetlands.

- Changes were made in the design of each alternative, so that all alternatives considered the possiblity of achieving fish passage around reservoirs on the South Santiam and McKenzie Rivers, and increased success in passage around Fall Creek.

- Changes in the estimates of smolt habitat capability were made in response to direction in the 1970 Memo, dated May 1, 1987 on Anadromous Fish Planning Coefficients.

- A discussion on sensitive fish species was added.

- Changes were made in the acres of land suited for timber production. Four soil types were added for an increase of about 29,000 acres.

- The empirical yield tables were updated to reflect growth through 1994, and adjusted for defect and breakage by species and size class.

- The Forest Inventory was adjusted to account for harvest through FY 1989.

- A new managed yield table was included in the DF/H and DF/TF working groups to allow one heavy commercial thinning.

- The Regional Fertilization Policy was changed to allow fertilizer to be added to stands with at least 60% Douglas fir.

- New Forestry concepts were applied to long-rotation management areas to provide habitat for old growth dependent species at an earlier age.

- A section was added to discuss the effects of the alternatives on Climate.

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The environmental consequences for all alternatives, except the No Change (NC) Alternative, fall within certain limits because of Forest-wide management requirements imposed to ensure long-term productivity of the land. While the frequency of occurrence of an output or effect may vary between alternatives, the environmental consequences may not be significantly different between the alternatives due to the common application of standards and guidelines (S&Gs) across all alternatives (except the NC Alternative) or due to the low sensitivity of the resources involved. These S&Gs apply to all management area prescriptions and are designed to protect Forest resources and mitigate adverse impacts.

The estimated effects of the alternatives result from the application of various combinations of management prescriptions. This mix of prescriptions generates different levels of resource outputs, goods and services. For each alternative, the interaction between the level of outputs and the source of production generates distinct environmental consequences. A familiarity with both quantifiable and qualitative outputs and effects is crucial for understanding the analysis and evaluation of environmental consequences. Quantitative outputs as well as nonpriced benefits and environmental qualities all contribute to the environmental consequences of the alternatives.

Environmental Consequences Of The Alternatives On Soil

Introduction

Long-term soil productivity is the natural capability of the soil to sustain the growth of plants and plant communities over time. It also includes the maintenance of soil conditions so that quality ground-water is supplied to lakes, wetlands and streams. Since most Forest uses ultimately depend on a productive soil resource, maintenance and enhancement of long-term soil productivity is widely recognized as a basic requirement of Forest management.

Effects of the Alternatives on Soil

Both external and internal factors affect soil productivity. External factors, such as climate and geology, are not influenced by Forest activities. Internal factors which can be modified by Forest activities are soil nutrients, and soil structure.

The effects of the alternatives on soil productivity will be described in terms of: (1) changes in nutrient levels and cycling; including application of fertilizer, and the role of surface soil organic layers; and (2) changes in soil structure, such as soil compaction and erosion. Forest management activities, such as timber management and road construction have the potential to affect soil productivity. The Forest and Regional Standards and Guidelines (S&Gs) define what kinds and levels of soil disturbances are acceptable, and what levels are considered detrimental to long-term soil productivity.

Table IV-1 displays the amount of the principle activities affecting soil that are scheduled for each alternative. This information provides the basis for the following discussion of effects.

Table IV-1. Primary Activities Affecting Soils

Activity	Units	NC [1]	K	A	J	W	D	L
Fertilization M Acres [1]	Decade 1	NA	102	88	118	96	102	56
	Decade 2	NA	92	99	74	79	74	24
	Decade 5	NA	101	107	77	73	68	26
Road Construction	Miles							
	Decade 1	NA	550	500	450	400	300	120
	Decade 2	NA	90	130	70	70	50	40
	Decade 5	NA	40	50	40	20	10	10
All Harvests [2]	M Acres							
	Decade 1	186	157	153	128	119	126	35
	Decade 2	NA	128	123	117	115	103	37
	Decade 5	NA	146	129	183	149	140	72
Final Harvests [3]	M Acres							
	Decade 1	144	126	121	102	91	99	33
	Decade 2	NA	126	121	100	94	100	28
	Decade 5	NA	118	116	82	81	85	23

[1]Total of acres scheduled for fertilization each decade.
[2]All harvests include clearcuts, shelterwoods, and thinnings.
[3]Final harvests include clearcuts and shelterwoods only.
[4]FORPLAN was not used with this Alternative. NA means the information is not available.

Nutrients - The cycling of nutrients through forest soils is essential for the productivity of plant communities, because the largest pool of nutrients exists in the soils. Other major sources of nutrients for the soil is the weathering of bedrock, and inputs from atmospheric sources (Waring and Schlesinger, 1985). Various soil animals are important in the process of decomposition of organic matter, such as needles and leaves, and bark. The majority of the chemical transformations are performed by bacteria and fungi in the upper soil layers.

Nutrient Addition - Nutrients added to the site by management practices such as fertilization would be designed to increase the availability of nitrogen to tree species resulting in additional vegetative growth. Nitrogen, usually in urea form can be applied directly to these soils.

The Forest has been participating in fertilization research for over 10 years, resulting in considerable information about timber growth response on various soil types (Legard 1980). Fertilizer trials have been made on approximately 30% of the Douglas-fir/hemlock zone, primarily on gentle slopes (less than 30%) at low elevations. Based on these trials, all alternatives propose to apply fertilizer to timber stands on suited lands composed of greater than 60% Douglas-fir.

Differences between alternatives in the number of acres fertilized during the first decade range from 56,000 to 118,000 acres, with 96,000 acres in Alternative W (PA). Use of fertilizer in the fifth decade ranges from between 26,000 acres to 107,000 acres, with 73,000 acres for Alternative W.

Nutrient Removal - Soil nutrients would be removed from the site through several processes; volatilization by fire, removal of vegetative material, and leaching.

Removal of the surface soil organic layer and large woody debris (downed logs, and limbs) results in direct loss of soil organic matter, certain plant nutrients, and a supply of energy to soil microorganisms.

Soil microorganism activity has been directly linked to soil productivity (Harvey et al. 1979). Organic matter in the surface layer has been found to be a primary source of nitrogen for young tree growth (Little and Ohman 1985). Large woody debris has been found to be an important link in the life cycle of symbiotic fungi which greatly enhance the ability of the roots of young conifers to take up water and nutrients (Maser et al. 1985). Because of this interdependence between above ground organic material supplies and below ground productivity processes, management of the long-term supply of large woody debris and surface soil layer can strongly influence soil productivity. As a result, the Forest has included S&Gs for the maintenance of large wood and organic matter on soils.

Fires of a high intensity, and moderate intensity fires of long duration, can cause severe impacts to soils. These impacts include the volatilization of up to 85% of the nitrogen content of leaves and twigs (Waring and Schlesinger); the loss of beneficial microorganisms; and the loss of organic matter for the nutrient holding capacity of the soil. However, it appears that prescribed burning of Forest residues at cooler temperatures has minimal effects on the long-term nitrogen content of surface soils. (Kraemer and Herman 1979). High intensity fires can also result in extensive mineral soil exposure and/or the creation of hydrophobic or "nonwettable conditions" which then accelerate topsoil erosion (Boyer and Dell 1980).

Research has not yet been able to quantify potential impacts to timber stand growth from surface organic matter disturbance. Thus, with the apparent long-term stability of nitrogen (the nutrient most subject to change), site productivity does not appear to be affected by prescribed burning when low to moderate fire intensities are utilized to protect a sufficient portion of the duff layer. Experience gained on the Forest over the last 10-15 years has led to guidelines ensuring that low to moderate fire intensities are used to protect surface layer organic matter.

Removal of forest products represents a loss of the nutrients from the forest ecosystem. In most instances the removal of woody biomass results in only a small percentage loss of the total nutrient elements in forest ecosystems, because the largest pools are in the soil, and because the foliage and branches that are left behind contain a large portion of the nutrient pool in the vegetation. However removal of whole trees for pulpwood or biomass energy would result in substantially greater nutrient removals. These may be replaced by natural processes, nitrogen fixing species or fertilizers (Waring and Schlesinger 1985).

Removal of nutrients by leaching into water runoff varies by season, and vegetation type. The highest rates of leaching have been observed following decomposition of organic matter four years after clearcutting (Adams et al. 1989). This is also discussed in the section on Water.

Soil Structure - Soil structure develops over long periods of time and influences the availability of water and nutrients to plants. Some management activities have the potential to alter soil structure. Two major changes which have the potential to occur are compaction and erosion of soil profiles.

Compaction - Soil compaction occurs when soil pore space is reduced in size because of physical pressure exerted on the soil surface. Compaction results in soil conditions that have reduced infiltration, permeability, and gaseous and nutrient exchange rates. Physical resistance to root growth can also occur in soils of high density. Soil compaction can occur on almost all soils with repeated passage of heavy equipment. At least 60 percent of the increase in bulk density in a well used skidtrail occurs after the first three to 5 passes (McNabb and Froehlich 1984). The area in compacted skidtrails can often range from 18 to 40% of the harvest area (Sidle 1980, Froehlich 1974, Dyrness 1972) from a single harvest entry with tractor skidding. Repeated entries for thinnings tend to increase the area in skidtrails, further impacting soil productivity (Chambers 1977). Mechanical slash piling also significantly increases the area disturbed and compacted.

Timber stand growth losses from compaction caused by tractor logging and tractor piling have been found to be significant and persistent. Stand growth loss estimates range from 5 to 13% (Wert and Thomas 1981, McNabb and Froehlich 1984). Growth losses are greatest for young stands, and lesser for older stands due to different portions of the root systems within affected soil layers. Natural recovery rates are generally slow in this region because the mild climate causes limited freezing and thawing of the soil. As a consequence, it is expected that compacted soils will remain compacted over the rotation of managed stands (McNabb and Froehlich 1984, Froehlich et al. 1983). Soil compaction also reduces water infiltration, and may result in increased overland flow. These conditions contribute to increased erosion and higher peak flows. Compaction can be minimized by avoiding or carefully managing tractor logging and slash piling.

Erosion - Surface erosion occurs from the forces of raindrop impacts, gravity (as with dry raveling), and wind in areas where soils lack protective ground cover. Erosion can be greatly increased by freeze-thaw action on some steep slopes. The extent to which this effects soil productivity has not been thoroughly researched. See the Soils and Geology sections in Chapter III for further discussion on erosion.

When soil is eroded by mass movement it often becomes less productive as soil layers are mixed. Removal of tree and shrub cover from steep slopes can accelerate mass movement on soils which are prone to landslides due to the loss of root strength. Groundwater regimes, which affect stability of slump-earth flow complexes, may also be affected by infiltration rate changes associated with timber harvest and road location.

Figure IV-1. Total Forest Erosion

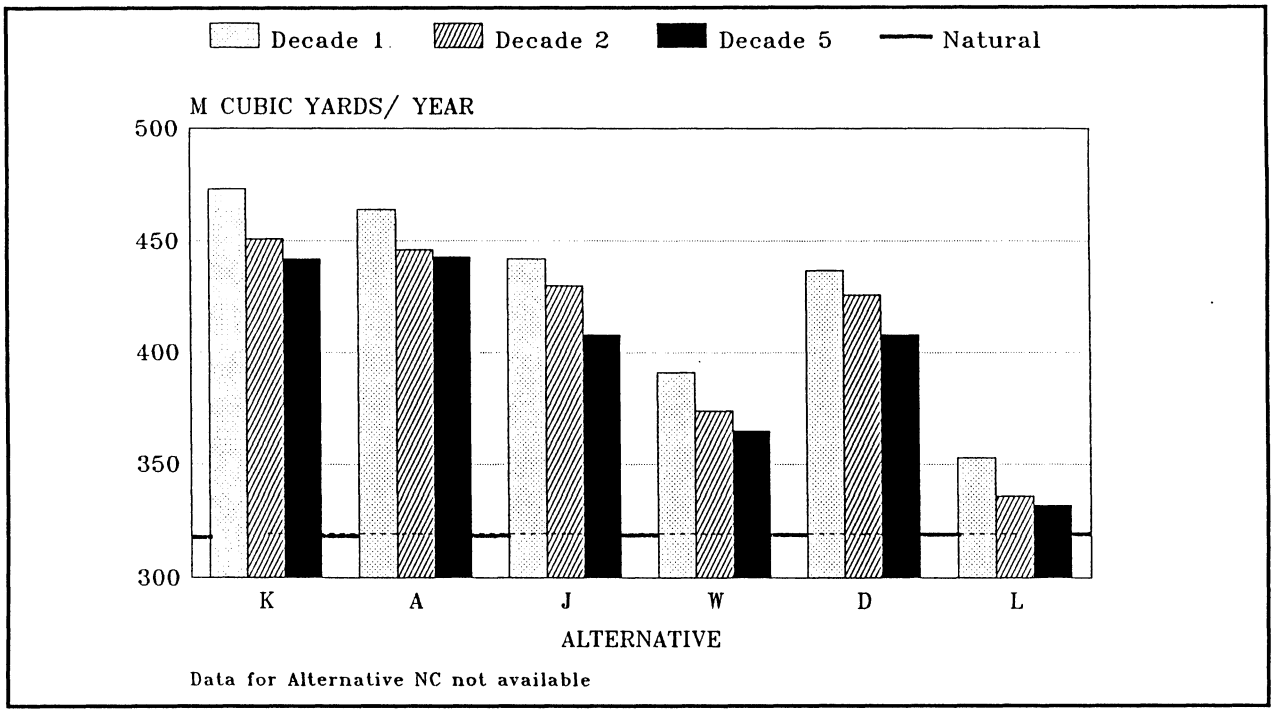


Table IV-2. Erosion by Alternative [1]

	Alternatives						
	NC [2]	K	A	J	W	D	L
Decade 1							
Debris Slides							
Natural	240.3	240.3	240.3	240.3	240.3	240.3	240.3
Roads[3]	--	14.2	13.2	12.2	11.6	10.1	7.6
Timber Harvest[3]	--	78.2	73.9	61.6	16.9	61.5	10.8
Surface							
Natural	79.3	79.3	79.3	79.3	79.3	79.3	79.3
Roads[3]	--	8.5	7.6	6.8	6.0	4.6	1.8
Timber Harvest[3]	--	53.0	49.8	41.6	37.0	41.2	13.4
Total	--	473.4	464.1	441.7	391.0	436.9	353.0
Decade 2							
Debris Slides							
Natural	240.3	240.3	240.3	240.3	240.3	240.3	240.3
Roads[3]	--	3.8	4.0	2.7	2.8	2.1	1.2
Timber Harvest[3]	--	76.4	71.7	63.8	12.7	63.2	4.0
Surface							
Natural	79.3	79.3	79.3	79.3	79.3	79.3	79.3
Roads[3]	--	1.3	1.9	1.1	1.1	0.7	0.6
Timber Harvest[3]	--	50.4	49.0	42.7	38.2	40.7	11.1
Total	--	451.4	446.2	429.9	374.2	426.3	336.4
Decade 5							
Debris Slides							
Natural	240.3	240.3	240.3	240.3	240.3	240.3	240.3
Roads[3]	--	1.0	1.2	0.8	0.5	0.2	0.2
Timber Harvest[3]	--	73.1	73.2	52.7	11.1	54.0	3.1
Surface							
Natural	79.3	79.3	79.3	79.3	79.3	79.3	79.3
Roads[3]	--	0.6	0.8	0.6	0.3	0.1	0.1
Timber Harvest[3]	--	48.1	48.0	34.6	34.0	34.4	8.9
Total	--	442.3	442.6	408.3	365.4	408.2	331.8

[1]Values represent estimates for the average annual amount of erosion in thousands of cubic yards.
[2]NA = Data Not Available. Alternative NC is estimated to be similar to Alternative K.
[3]Amounts include erosion from decade indicated and a smaller amount carried over from previous decade.

Erosion, both surface and mass movement, would increase above natural levels, based on the acres harvested, acres of unstable soil types harvested and miles of road constructed in each alternative. Erosion index values shown as a basis to compare alternatives are displayed in Table IV-2 and Figure IV-1 above. Estimated erosion volumes do not indicate amount that would be delivered to streams or project downstream effects. The potential effects of erosion on water quality are discussed in the Water Section of this chapter.

The rate of road construction and consequently erosion from newly constructed roads declines after the first decade in all alternatives since most of the transportation system would be in place by the end of the first decade. Of the erosion over natural levels that is generated in the first decade, approximately 13 to 28% would come from new roads with the remainder coming from harvested areas.

Soil disturbance is an unavoidable consequence of Forest management activities such as timber harvest, road construction, and to a much lesser degree, intense recreational use such as repeated use of campsites and trails.

For each harvest entry, the extent of soil disturbance depends upon a number of factors. Soil type and condition, terrain, the volume and size of timber removed, the size of units, the weather, contract compliance, and the skills of individual equipment operators all contribute to the intensity of impact. The area impacted by final timber harvest, the harvest method employed, and the method of site preparation directly affect the degree of disturbance to the soil surface. Differences in acres harvested between alternatives are the most direct indicator of relative risk to soil productivity through compaction.

Differences Between Alternatives - Harvest options vary widely in their impact on the soil according to the yarding system used. Cable and aerial yarding systems affect a much smaller area than does tractor-based logging. High-lead systems may disturb only from 15 to 20% of the harvested area (Dyrness 1967, Sidle 1980). Impacts tend to be higher if downhill yarding is used. Skyline systems generally disrupt less than 10% of the area (Dyrness 1967), and aerial systems affect less than 5% of the ground. In all of the alternatives, the majority of the Forest (60 to 70%) will be harvested by skyline systems. The remainder of the harvested areas will use ground based systems (20% to 30%) or aerial systems (10% to 20%).

Alternative NC would impact the most acres with final harvest during the first decade, with the amount of final harvest gradually declining as commercial thinning increases to the point of providing over half the harvest volume by decade five. Final harvests in Alternatives K, A and J would impact almost as many acres in each of the first two decades, and then decline to lower levels in decades three, four, and five. Final harvests in alternatives W (PA), D, and L would impact progressively fewer acres each decade.

Alternative K would produce the highest amount of erosion in the first decade (153.9 thousand cubic yards annually), representing an increase of 48% over the natural rate and nearly equal to current erosion levels (154.8 thousand cubic yards annually).

Alternative A would produce approximately 144.6 thousand cubic yards annually in the first decade. This represents an increase of 45% above the natural levels and a decrease of about 7% from current erosion levels. In the first decade, Alternatives J and D generate slightly lower amounts annually (122.1 and 117.4 thousand cubic yards respectively). Alternatives J and D would result in erosion levels decreasing approximate 21% and 24% respectively from current erosion levels.

Alternatives W (PA) and L produce the least annual erosion (71.5 and 33.5 thousand cubic yards respectively in the first decade). For Alternative W (PA), this corresponds to an increase of 22% above natural levels and a decrease of approximately 54% from current erosion levels. For Alternative L, this represents an estimated increase of 10% above natural erosion levels and a decrease of approximately 78% from current erosion levels.

In the fifth decade as the area of final timber harvest decrease, and road construction decreases in all alternatives, erosion would also decline. Alternatives K and A would generate the highest annual amounts of erosion at 122.8 and 123.0 thousand cubic yards respectively. Alternatives J and D would produce similar amounts annually of approximately 88.7 thousand cubic yards. Alternative W (PA) would produce a lower volume estimated to be 45.9 thousand cubic yards annually. Alternative L would generate the least amount of erosion of approximately 12.3 thousand cubic yards annually. Alternative NC is estimated to fall in the same range as K and A because the majority of the harvest volume by the fifth decade comes from commercial thinning. The effects of commercial thinning on erosion are estimated to be negligible. This is due to the low degree of disturbance to the soil duff layer where stands are thinned by cable logging systems and rarely treated with fire.

Cumulative Effects on Soil

The cumulative effects of management activities over an area are considered in the S&Gs which require that no more than 20% of an area is cumulatively displaced, puddled, or compacted, and specifies the amount of soil cover and large woody debris to be maintained on the ground. At this time no satisfactory means of testing, or unit measure of long-term soil productivity, has yet been devised. The survival and growth of planted seedlings give an indication of changes in site productivity, but little is known of how indicative short-term performance is of long-term productivity.

Mitigation Measures for Soil

In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity. Determining the suitability of specific soils for timber harvest activities is an important first step in preventing soil related impacts. In responding to NFMA regulations, 144,851 acres of available, forested lands are currently classified as unsuited for timber management. No timber harvest activities are scheduled on those lands because of the potential for irreversible soil damage and/or the inability to ensure regeneration of forested stands within 5 years. Lands that exceed 30% slope gradients, or soils that have high clay or silt content, are not planned for tractor yarding or slash piling because of equipment limitations that lead to excessive soil displacement and compaction.

One-end suspension or full suspension cable yarding systems are used to avoid a high degree of soil disturbance on soils that are highly susceptible to displacement, surface erosion, mass movement, or compaction. Both duff and fuel moistures are used to determine when slash can be burned with minimum impact to surface organic material. Planned slash treatments are either low intensity broadcast burns, burning via small handpiles, or yarding of slash without burning on these more sensitive soils.

Ground skidding equipment is primarily restricted to designated skid trails or not allowed. Reducing the effective weight of the tractors and reducing the number of trips over a piece of ground are other means to reduce the risk of soil compaction and displacement (Froehlich and McNabb, 1983). Yarding over frozen ground, or over a deep, solid snow pack reduces soil disturbances and can protect advanced regeneration. In many situations, cable systems are used for yarding in place of tractors to reduce soil disturbance. Tractor piling will generally not be considered an option unless justified on a unit by unit basis. Additional measures to reduce soil compaction and displacement resulting from tractor piling include cable piling, handpiling, and low to moderate intensity broadcast burning. Rehabilitation with

equipment capable of reaching subsoil depths (generally 10 inches or greater) will be used to loosen and break up compacted soil when appropriate.

On slopes exceeding 30%, cable yarding systems are used. Uphill yarding is preferred over downhill yarding to reduce log gouging of the soil. Cable systems that partially or fully suspend logs do not compact or deeply disturb as much ground as no suspension systems (Dyrness 1972). Long-span cable yarding systems will reduce the road densities needed for ground skidding and shorter span systems. This practice avoids soil and water quality impacts that may result from additional road construction.

Management prescriptions, standards, and guidelines require special management considerations whenever activities have a potential of triggering mass movement events. Avoidance of problem sites is the alternative most preferred. Other than avoiding timber harvest on problem sites, ways to reduce the chances of mass movement include: retaining more trees, shrubs, and ground cover than normally done during timber harvest; using cable yarding systems that one-end or fully suspend logs; allowing felling and yarding only during dry soil conditions; draining wet, unstable areas; and avoiding broadcast burning. Ways to reduce the chance of mass wasting associated with road construction include: avoiding problem sites; not overloading or undercutting unstable ground; special spacing, sizing, and location of culverts; stabilizing cut and fill slopes, (e.g., rock buttresses, retaining walls, and planting); inspecting and cleaning of ditches and culverts; building full-bench roads where slopes exceed 55%, and eliminating side-cast waste; and monitoring of road conditions after construction.

To maintain long-term productivity, compacted areas such as skid trails, landings, temporary roads, stock loading areas or campsites can be tilled or subsoiled. Easily eroded sites can be mulched, fertilized, and seeded or planted. Cross ditches can be installed at appropriate intervals to direct water flowing over compacted surfaces such as trails and roads. Roads can be made more erosion resistant by surfacing. On the older Forest roads side-cast pullback will be implemented to reduce the debris avalanche potential.

These mitigation measures would be used in all the alternatives. The particular measures used would vary depending upon the site specific conditions. Project analysis undertaken prior to project implementation, ongoing project administration, and project monitoring would determine the specific needs and measures used. The degree or amount of specific mitigation measures likely to be used used in each alternative is relative to the amount of acres harvested (Figure IV-1) or miles of road constructed.

Relationships With Other Agency Plans or Policies for Soil

There are no known conflicts between the effects of the alternatives on soil and the plans or policies of other State, Federal, or local agencies.

Information Needs

The Forest recognizes gaps in existing data and research needs that would be desirable to fill prior to the preparation of the next Forest Land and Resource Management Plan. In the area of maintaining long term site productivity, more information is needed on the following:

- The effects of different harvest practices and removal of biomass.
- A further assessment of the effects of burning and compaction.
- The effect of management practices on the incidence and severity of pathogens and insects as they effect long-term productivity.

Environmental Consequences of the Alternatives on Water

Introduction

This section describes the potential adverse direct, indirect, and cumulative effects of the proposed alternatives on water quantity and quality in streams, lakes, and wetlands; on stream channel conditions. Water quality refers to the quality of the water within streams, lakes and wetlands, while stream channel condition refers to the physical structure of the stream substrate and stream bank stability. Stream channel condition is a strong indicator of the quality of habitat for all aquatic species for which anadromous and resident salmonids are Management Indicator Species.

This section discusses both water quality and stream condition because many of the same processes affect both. The influence of water quality and stream condition on beneficial uses is considered here and in the Fish section because fish populations are considered an important beneficial use throughout the Forest.

Direct, indirect and cumulative effects are evaluated against the requirements established in NFMA regulations and the Clean Water Act. Other laws are mentioned where applicable. Management Requirements described in NFMA include the following:

- Minimize serious or long-lasting hazards from flood and erosion unless they are specifically accepted.
- Protect streams, streambanks, shorelines, lakes, wetlands and other bodies of water.
- Special consideration shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses or deposits of sediment shall be permitted within these areas which seriously and adversely affect water conditions or fish habitat.

The Clean Water Act declares a policy to "restore and maintain" clean water (Sec.101) and directs states to adopt antidegredation policies. The state antidegradation policy and implementation methods must safeguard existing water uses. No degradation is permitted in "Outstanding National Resource Waters" which includes designated Wild and Scenic Rivers.

Other beneficial uses to be protected are those identified by the State of Oregon (OAR 340.41) and discussed in Chapter III. These include anadromous and resident fish spawning and rearing, private and public domestic water supplies, hatchery intakes, use by wildlife, boating, aesthetic recreation, hydropower, and several others. Stream Classes are defined according to the beneficial uses which occur. Class I streams are those with anadromous fish, significant sports fish, and domestic water intakes. Class II streams are used by resident fish, and Class III stream are other perennial streams. Class IV streams are intermittent. The water quality and stream conditions in Class I and II streams is of primary concern however the influence of Class III and IV streams is equally important in determining the effects in downstream reaches.

Quantitative measures of water quality needed to provide for many of these beneficial uses has not been determined. Where the State of Oregon has established numerical standards designed to protect beneficial uses (ie. for turbidity and temperature), application of Best Management Practices is the primary means of achieving these standards. In the absence of models which can predict under what circumstances these numerical standards would be met, the differences between the alternatives is

described in terms of *risk* of not protecting these beneficial uses. This risk is described in the section on Cumulative Effects.

Direct and Indirect Effects

All alternatives propose activities which have the potential to affect water quality or stream condition to varying degrees. Activities with potential to cause adverse effects are timber harvest, road management, recreation use, and wildlife management. The potential direct and indirect effects from proposed alternatives fall into 5 main categories; changes to riparian conditions, increases in levels of sediments in streams, changes in runoff patterns, changes to chemical characteristics, and changes to water yield. Effects to these 5 watershed processes are described below.

Changes in Riparian Condition - Riparian areas, floodplains and wetlands are the physical link between the upslope terrestrial ecosystem and the stream, lake, or wetland ecosystems. Riparian areas provide shade, large woody material (LWM), and small organic material to aquatic habitat. Riparian areas are also a particularly diverse part of the terrestial ecosystem, providing critical plant and wildlife habitat diversity and 80% of dispersed recreation (Clark et al. 1984). Riparian areas commonly have highly productive timber sites and frequently are the most economic road locations. A full description of the effects of harvest in riparian areas is found in the Vegetation-Riparian section of the Chapter IV. Discussion here is limited to the effects of riparian management on water quality and stream condition.

Practices in riparian areas which have the potential to effect water quality and stream conditions are those which change a) shade, b) streambank stability, c) the rate of input of LWM, d) floodplain characteristics, e) wetland characteristics. These are described in more detail below.

Shade - Increased solar radiation has the potential to increase water temperatures following removal of vegetation.

The direct effect of removal of shading vegetation from streams is to allow more solar radiation to reach the water. The indirect effect is that during summer months water temperatures increase. The Forest is required by the State Water Quality Standards to maintain stream temperatures below specific levels. In cases where summer streamflow is not influenced by snowmelt and where past practices have removed riparian cover, temperatures standards are sometimes exceeded during summer days.

The beneficial use most effected by increases in temperature are fish, particularly Bull Trout in the McKenzie River sub-basin, and fish in hatcheries fed by Salmon Creek.

The degree to which these potential effects occur is determined by the amount of timber harvest and road building in riparian areas and on the methods used. A prescription was developed to determine the maximum level of harvest that would be compatible with meeting Management Requirements specifically related to meeting State water quality standards for temperature. It was determined that timber harvested at rotations lengths of 200 years for Class I and II streams, and 140 years for Class III streams would provide enough shade to maintain stream temperatures based on average widths of streams as determined in the field. (Stewart & Skeesick. 1981) This prescription was modeled as harvest of no more than 5% per decade along Class I and II streams and 7% per decade along Class III streams.

This management requirement prescription was selected for riparian areas in Alternatives A, K, and J. The prescription selected for Alternative D was designed to provide higher quality stream conditions, and would schedule harvest at 5% per decade only on Class III streams on an average. No programmed harvest was scheduled from Class I and II riparian areas. Riparian prescriptions for Alternatives W

and L were designed to provide a high level of assurance that all riparian dependent resources would be protected including riparian dependent plant and animal species; and to maximize the overlap of resource use in these areas. In these two alternatives riparian areas are intended to provide distribution of interior wildlife species, provide optimal thermal cover for big game, and provide quality recreation, in addition to meeting requirements for water quality and stream conditions. No programmed harvest is scheduled for riparian areas in these alternatives. The cumulative reduction of LWM is closely correlated with the cumulative acres of riparian areas harvested which is shown in the section on Riparian vegetation in this Chapter.

Riparian harvest under Alternative NC is taken from the current Land Management Plan, where it was termed timber yield from Streamside Management Units, part of the Special Harvest Component. Riparian areas associated with Class I, II, and III streams were grouped together with a projected timber yield of 72%, which approximates a 140-200 year rotation.

Streambank stability - Direct changes to channel condition have the potential to occur where streambanks are disturbed. Direct distubances can occur during timber harvest, construction of road crossings and trail crossings, and by heavy recreational or livestock use on streambanks.

As used here, channel condition describes the stability of stream banks and the composition of stream substrate. The importance of these characteristics to aquatic habitat is described in the section on Fish. Disturbance of vegetation and soil on streambanks can result in increases in sediment to the stream, and reduction in stable, vegetated overhanging stream banks.

Stable stream banks provide fish shelter, and minimize the risk of increases in turbidity. Substrate which consists of well sorted gravel, with less that 25% fines is considered the best quality spawning substrate.

Disturbance of vegetation and soil has the potential to occur when logs are not fully suspended over streambanks during yarding from or through riparian areas. Streambank disturbance also has the potential to occur during and following construction of road crossings. Road construction which creates large cut or fill slopes adjacent to the stream have the highest potential for adverse effects. Increases in streambank erosion have the potential to occur when culverts are incorrectly placed so the stream current is directed into erodible streambanks. Because of the proximity to the streams, a relatively small disturbance from any of these activities can have an immediate adverse effect to beneficial uses in the immediate area.

On some landtypes root strength is required to maintain streambank stability. Field inventory for the 1977 plan determined that 21.5% of Class I, II and III riparian areas would need to be fully protected from timber harvest in order to maintain streambank stability, because the areas were too steep and unstable to be acceptably managed.

Localized damage to streambanks has the potential to occur in areas of heavy use by livestock. The application of BMP's include measures to control livestock distribution. Only the existing allotment is proposed to continue under the alternatives.

All alternatives propose the use of BMPs for operations in the riparian area. Alternatives with programmed harvest in these areas have a higher risk of direct changes to the streambank occurring.

Large Woody Material - Future management of vegetation in riparian areas has the potential to change the long-term input of Large Woody Material to streams, wetlands and lakes, with subsequent changes to stream channel condition, and streambank stability.

Trees in riparian stands provide input of Large Woody Material (LWM) to the water. As trees in riparian stands are blown over, or the tops broken out, the wood is gradually recruited into stream channels, and functions as an integral part of the stream channel. Research indicates that 90% of large wood is recruited from within 100 feet of the channel on all stream classes.(McDade)

LWM influences the stability of stream channels by armoring streambanks, and dissipating the velocity of water. The role of LWM in a stream differs between stream channel types. A large reduction in the levels of LWM in streams has been shown to correlate with stream widening on low gradient streams.(Grant et. al 1989) Stream widening would result in loss of productive land area, and shallower, more exposed aquatic habitat. Low gradient streams are generally Class I and II streams. On steeper gradient streams, generally Class III and IV streams, instream wood controls the flow of sediment through the system by storing silts, gravels, and cobbles behind them. (Megahan, 1982) Changes in the levels of LWM in Class III and IV effects levels of sediment transported to Class I and II streams, and is discussed more thoroughly in the section on sediment.

Levels of LWM strongly influence the creation and stability of aquatic habitat conditions such as pools, side channels, and well-sorted gravels.

Over the next 50 years, decreases in the number and size of trees falling into the streams would increase the risk that current levels of stream channel stability and the complexity of aquatic habitat would not be maintained over the long-term. Monitoring during the next decade would begin to provide important information on the correlation between existing condition of riparian areas, complexity of aquatic habitat, and stability of stream channels.

As of 1981, 39% or 1,313 miles of Class I, II, and III streams were in or adjacent to harvest units or roads (Stewart and Skeesick, 1982). The amount of protection afforded these streams was variable, but in general, during the 1960s and early 1970s LWM was removed from streams where accessible. Stream habitat features which are created by the presence of large woody debris were reduced, and will not recover until adjacent riparian stands have timber of sufficient size and condition to provide trees which are stable in the stream environment. This potentially occurs beginning 60 to 80 years after harvest in areas where conifers are established. It may take several hundred years for conifers to develop where deciduous stands are currently dominant.

Alternatives A, K,and J would result in forest-wide reductions of input of LWM of more than 4% in the first decade, 7% in the second decade, and 18% by the 5th decade. Alternative D would result in a 0% reduction for the first decade, 2% by the second decade, and 6% by the 5th decade. Alternatives W and L would program no additional harvest over the next 50 years, thus allowing recovery of riparian areas harvested in the past.

Floodplains - Future management of timber within the 100 year floodplains of streams, wetlands and lakes have the potential to alter the functioning and value of floodplains.

Floodplains function to temporarily store floodwaters thereby reducing the risk of downstream flooding. These areas also provide safer, slackwater habitats for fish during high flows. Characteristics of floodplains which reduce stream velocity are standing and downed trees and other vegetation which creates roughness of the floodplain surface.

Executives Order No. 11988 requires that the agency take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. In all the alternatives management activities within the 100 year floodplain would comply with requirements of Executive Order 11988. Alternatives with

programmed harvest from Class I and II streams have a higher risk that these values would not be protected.

Lakes and wetlands - Future management of vegetation in riparian zones on lakes and small wetlands has the potential to adversely effect the water quality and aquatic habitat of these areas.

The requirement to provide protection for the water quality in wetlands and lakes is established in the Clean Water Act. Direction to provide for other beneficial values of wetlands is established in the Wetland Protection Executive Order 11990. This direction has been included in the S&Gs for all alternatives. Alternatives NC, A, K, and J accept higher risk of adverse effects to these resources by scheduling timber harvest from lakeside areas. Alternatives W, D and L do not schedule harvest from lakeside areas.

Small wetlands, such as bogs, ponds, and overflow channels would be evaluated for beneficial values and potentials under all alternatives. These areas are too small to be evaluated for programming harvest.

Riparian Summary - In Alternatives W and L on Class I, II, and III streams, an area of varying width immediately adjacent to the channel would be withdrawn from programmed timber harvest. As a result these alternatives have a high probability of success in protecting beneficial uses that are dependent of cool water temperatures, protecting streambanks, wetlands and lakes, and minimizing serious and long-lasting hazards from floods. The recovery of adjacent, previously harvested riparian stands, as well as stream channels would be promoted. The other alternatives carry a higher risk of not meeting these objectives.

The riparian acre base under Alternative NC is incomplete, and proposed management includes harvest on lands on which current technology cannot assure that irreversible resource damage would not occur. As a consequence, Alternative NC poses the greatest risk to water and fisheries resources.

Changes in Sediment - Water quality in Class I and II streams is often characterized by turbidity levels of the streams. Turbidity usually increases as the amounts of sediment particularly the clay and silt sized particles which reach the stream. Stream conditions and habitat are influenced by the amounts of sediment which is deposited in the stream channel. Water quality of lakes, wetlands and reservoirs is effected by the amount of sediments which travel through Class I, II and III streams, or the amount of sediment which remains suspended in reservoirs, lakes and small wetlands.

Although some sediment is necessary in stream ecosystems, optimum or threshold amounts and sizes have not been identified. The adverse effects of smaller sized material has been shown to reduce the survival of salmonid fry as they emerge from spawning gravel. Increases in sediment can also alter channel width, depth and gradient, with other indirect effects as the channel adjusts to additional bedload. (Bradley, Williams, Klingeman, 1989)

The risk of increasing sediment delivery to the streams increases with the acres of ground disturbing activities and varies according to the source of the eroded material. Table IV-2 in Soils summarizes the estimated relative erosion under each alternative. The primary sources of sediment is from mass movements, particularly debris torrents, and from surface erosion. The risk that these processes would result in increased stream sediment is described below.

Mass Movement - Sediment generated from mass movement, particularly debris slides, has the highest potential to impact water quality, channel stability and aquatic habitat. (Sediment generated from surface erosion is discussed in the following section.) Water quality is effected by debris slides when they reach water. No quantitative link has been made between the volume of soil moved in debris

slides and increases in water turbidity because of the extreme variation in the landtypes being considered. The conclusion can be made however that the **risk** of adverse turbidity levels increases as the incidence of debris torrents increases.
Debris slides which mix with water and continue through a stream channel are termed debris torrents. Debris slides and torrents occur as part of the natural weathering process, and most of the steep headwater channels have been subject to debris torrents at some time. Under natural conditions debris torrents would occur most frequently during major storm events when soil is saturated, and following major wildfires, when root strength is reduced. Under managed conditions, soil saturation and root strength still influence the rate at which debris torrents occur.

The distance debris torrents travel in a stream channel is largely dependent of the sinuosity and gradient of the channel. Torrents move farther in straighter, steep channels, (Swanson and Roach, 1987) and depending on the amount of LWM in the channel available to reduce the velocity of the debris torrent. (Ketcheson and Froelich 1978). Debris torrents often increase in size as they travel downstream, particularly where they fill a culvert, resulting in saturation of the road fill and complete failure of the fill material.

The force of a debris torrent travelling through Class III and IV streams often moves existing LWM and stored sediments out of these steep, headwater streams into the low-gradient streams causing increases in turbidity and bedload. The downstream channel adjusts in width and depth in response to increases in bedload. Where LWM is deposited in bedrock channels it sometimes increases aquatic habitat complexity but in some cases can make the stream temporarily impassible. After a debris torrent removes LWM in Class III and IV streams water velocities may increase and silts and gravels may be scoured from the streambanks and channel bottoms resulting in increased turbidity downstream. Streambanks are susceptible to additional erosion following removal of LWM where composed of deep soils, and where extremes in peak flow runoffs occur during rain on snow events.

Debris torrents have the potential to influence wetlands, lakes and reservoirs also. The effects to small wetlands and small lakes may be to substantially reduce the storage capacity of wetlands, and to reduce the water quality. In larger lakes and reservoirs, debris torrents would also increase turbidity. In some cases, such as Hills Creek Reservoir the material which enters the reservoir, may be very fine, clay-sized material which has the potential to stay in suspension for long periods of time. These sediments may settle out eventually, but are usually resuspended when the reservoir level is drawn down, and the exposed draw-down zone is subjected to rain-erosion. Increases in turbidity have the potential to decrease the recreational quality of the reservoir.

Debris slides occur as part of the natural, unmanaged hillslope process, and in areas managed for timber production. Studies have shown that management practices during the period of 1950 to 1980

The following sections describe the three major influence on changes to the size and frequency of debris slides.

Unstable and Potentially Unstable Landtypes - The inherent stability of the landtypes influences the changes size and frequency of debris slides.

Landtypes with the highest risk of mass movement are those which are currently "unstable". These are areas which have moved recently enough to leave observable signs on the soil profile. These have been mapped as "unsuited for timber production due to irreversible damage", and have been excluded from timber scheduling in all alternatives.

Table IV-3 Percent Suited Lands on Potentially Unstable Soils by Watershed

	Alternatives						
Watershed Name	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Lookout[1]	NA	NA	NA	NA	NA	NA	NA
L.N. Santiam	0	0	0	0	0	0	0
Detroit Tributaries	7	5	5	5	5	5	3
Quartzville	28	26	26	26	25	19	13
Middle Santiam	5	5	5	4	4	4	1
South Santiam	8	6	6	6	6	5	3
Upper McKenzie	0	0	0	0	0	0	0
Calapooia/Wiley	11	11	11	11	10	11	10
Blue River	17	15	15	15	14	14	12
Lower McKenzie	19	20	18	17	17	7	9
Quartz Creek	19	18	18	18	17	18	14
S.F. McKenzie	2	2	2	2	2	2	1
Lower Horse Creek	0	0	0	0	0	0	0
Fall Creek	28	26	26	25	23	23	16
Winberry Creek	9	8	8	8	8	8	5
Lower NFMF Willamette	8	8	8	8	7	7	5
Salmon Creek	4	4	4	4	4	4	2
MF Willamette Tributaries	20	17	17	16	15	14	5
Salt Creek	3	2	2	2	2	2	2
Lower MF Willamette	17	14	14	13	12	13	9
Hills Creek	4	3	3	3	3	3	3
Upper MF Willamette	1	1	1	1	1	1	1
Upper NFMF Willamette	0	1	0	0	0	0	0
Wilderness Lakes	0	0	0	0	0	0	0
Upper Horse	0	0	0	0	0	0	0
Canyon	7	7	7	7	7	7	5
Hackleman	0	0	0	0	0	0	0
Scott	0	0	0	0	0	0	0
Deer	0	0	0	0	0	0	0
Blowout	5	4	4	4	4	4	4
Lower N. Santiam	5	4	4	4	4	4	4
Upper N. Santiam	0	0	0	0	0	0	0
Breitenbush	8	6	6	6	6	6	4
Forest Percent	6	6	6	6	5	5	3

[1]Not included in this assessment

The next highest risk is from the group of landtypes which are "potentially highly unstable". These are generally steep tuffs and breccias, or shallow soils. Management practices on these soils require extra mitigation measures. The effects of the alternatives would closely follow the number of suited acres on potentially highly unstable landtypes and the types of mitigation measures included. Mitigation measures which would reduce rates of mass movement below levels experienced in the past 40 years are described and referenced at the end of this Water section and in Chapter II, Alternatives Considered in Detail.

The amounts of potentially highly unstable land available to harvest varies by alternative. Only a small proportion of these acres would actually be harvested in the first decade but the total amount available to harvest reflects some of the associated risk for each alternative.

Alternative NC schedules harvest on approximately 128,000 acres of potentially highly unstable land, Alternatives K, and A include approximately 115,000 acres, Alternative J includes 113,000 acres, Alternative W includes 106,000 acres, Alternative D includes 102,000 and Alternative L includes 72,000 acres. The percent of unstable land varies by watershed as shown in Table IV-3.

Timber harvest - Timber harvest has the potential to increase the rate and frequency of debris slides by reducing root strength on steep slopes.

A direct result of the harvest of trees is the loss of root strength which follows. The subsequent indirect effect under some circumstances is an increase in debris slides. Root strength is one important factor in maintaining slope stability on slopes over 60%, particularly in areas where soils naturally have low cohesion characteristics, and in areas where soils become saturated. (Hammond et al.) Slides may occur midslope on potentially highly unstable areas, on steep streambanks, and in headwall areas which are usually adjacent to Class IV streams.

Alternatives vary in treatment of these potentially highly unstable landtypes. All alternatives prescribe BMPS which are intended to maintain slope stability in order to maintain water quality. Alternatives W and L are designed to ensure a that these BMPS are very effective by including S&Gs with specific direction to maintain trees where needed for root strength, and where needed to replace LWM in steep streams with the intent of maintaining the natural rate of debris torrents movement through the stream system. In alternatives NC, K, A, J and D, no specific direction or modelling addressed this effect, consequently the risk of debris torrent occurrence would be higher in these alternatives.

Commercial thinning is expected to maintain enough root strength in these areas so that the risk on debris torrents is not substantially increased following removal of the trees.

Roads - Existing and future roads have the potential to result in increased size and frequency (rates) of debris slides where pore water pressure and/or soil shear strength is altered.

Several studies have identified roads constructed between 1950 and 1980 as primary source of debris slides, and debris torrents. (Swanson and Grant,1982) Road construction often alters the soil shear strength and pore water pressure, two important factors in the size and frequency of debris slides. As these two factors are changed debris torrents have the potential to occur more frequently. They are particularly likely to occur as soil moisture increases particularly when road fills become saturated. Road fills have the potential to become saturated when a culvert is plugged by a debris torrent or when a drainage ditch becomes blocked and runoff is rerouted from the ditch to the road surface and fill. The ditch may become blocked by failures of the cutbank material.

Some existing roads have created conditions where a high potential for debris torrents still exists. At some sites on these roads, uncompacted fills were constructed, or material excess to the construction of the road, was "sidecast" over the edge of the road, also uncompacted. Where this material is uncompacted, it becomes saturated and fails more readily than roads constructed with compacted fills. These sites have the potential to continue failing through the following decade as the root strength continues to decline. Projects to stabilize these sites are proposed in all alternatives. The amount of sidecast material with the potential to fail is estimated to be in addition to that shown in Table I-1-3. This is because during the study period, the root strength in these sidecast areas had not decreased to its current low condition.

Roads constructed in the future, in all alternatives, would use practices which are currently recognized as "Best Management Practices", such as prohibiting construction of uncompacted fills and sidecast material. These practices are described in more detail in the section on Mitigation Measures.

Road closures, as proposed in all alternatives to meet wildlife and recreation objectives, can have an adverse effect on water quality and stream condition, depending on the methods used to close the roads. Where permanent roads include culverts and cross-drains, the ability to reach these drainage structures for periodic maintenence, would be a major factor in the frequency and size of potential road failures from plugged culverts. Road closures can also result in less sediment as fewer roads are available for use during wet weather.

The relative increase in amounts of material moved by debris slides during the first decade is displayed in Table IV-4 for each watershed by alternative. Also shown in the table is the natural rate for each watershed, expressed as cubic yards per acre. Under natural conditions there is a wide variation in the size and frequency of debris slides, associated with the inherent stability of the geology. (Numbers used in this and other tables expressing erosion are index numbers for relative comparisons between locations and alternatives.) The natural level, and the increases from management activities are used as an index of the potential sediment yield and consequently an indicator of decreasing water quality and stream condition. Alternatives with low soil erosion and consequently lower sediment yield should be considered to provide the best water quality. Alternative L has the lowest risk because of the low number of acres harvested, and few miles of road constructed. Alternative W is the next lowest, followed by Alternative D. The major differences between W and D is the reduction in risk of sedimentation by protecting Class IV and headwall stream areas in Alternative W. Alternatives J, A, and K have the highest risk. More information about how the estimates were made is given in Appendix B.

Table IV-4 Percent Increase in Potential Debris Slides [1]

Watershed Name	Total Natural Cubic Yards	Background Cu Yds/ Acre/Yr [2]	% Increase Years 1977-89	% Increase above Natural Levels by Alternative-- Years 1990 to 2000						
				NC [3]	K	A	J	W	D	L
Lookout	3,048	.20	NA[4]	--	NA	NA	NA	NA	NA	NA
L.N. Santiam	5,556	.15	6	--	23	23	42	6	25	1
Detroit Tributaries	5,109	.16	21	--	18	34	14	10	22	4
Quartville	7,871	.22	39	--	61	66	21	20	59	11
Middle Santiam	8,621	.15	34	--	35	34	30	11	19	6
South Santiam	11,073	.15	20	--	30	52	40	9	40	13
Upper McKenzie	4,191	.03	12	--	11	12	20	5	2	3
Calapooia/Wiley	1,956	.19	39	--	57	54	5	8	60	16
Blue River	8,250	.20	43	--	53	47	80	19	16	13
Lower McKenzie	3,207	.15	32	--	76	65	172	14	27	16
Quartz Creek	2,707	.18	54	--	42	28	11	15	39	11
S.F. McKenzie	17,062	.15	18	--	22	24	27	6	13	3
Lower Horse Creek	3,839	.15	18	--	33	27	82	12	22	3
Fall Creek	17,681	.22	63	--	60	21	24	17	53	11
Winberry Creek	4,854	.21	48	--	38	31	8	15	21	7
Lower NFMF Willamette	15,902	.18	39	--	50	48	49	13	19	7
Salmon Creek	12,792	.15	32	--	49	47	9	12	42	5
MF Willam Tributaries	10,101	.20	50	--	53	62	65	20	45	11
Salt Creek	8,351	.12	29	--	19	28	19	9	38	6
Lower MF Willamette	19,112	.18	52	--	55	56	30	15	28	12
Hills Creek	6,636	.17	52	--	32	25	9	10	52	8
Upper MF Willamette	12,580	.11	28	--	39	39	6	9	27	5
Upper NFMF Willamette	4,240	.06	12	--	26	20	21	4	11	2
Wilderness Lakes	1,342	.05	0	--	0	0	0	0	0	0
Upper Horse	3,402	.04	1	--	0	0	0	0	0	0
Canyon	2,635	.13	28	--	62	4	7	17	46	5
Hackleman	1,682	.05	15	--	14	18	31	5	3	3
Scott	976	.03	61	--	44	18	14	24	49	13
Deer	5,059	.16	26	--	28	25	26	7	26	5
Blowout	5,300	.20	49	--	40	12	10	15	46	16
Lower N. Santiam	7,926	.13	48	--	19	43	13	14	22	11
Upper N. Santiam	6,401	.07	25	--	4	17	25	7	6	4
Breitenbush	10,822	.17	40	--	42	41	55	14	35	8

[1]Relative index values
[2]Average annual volumes
[3]Data not available
[4]Management activities in Lookout Creek are not included in this assessment

Surface erosion - Management activities have the potential to increase surface soil erosion, and the associated risk of this soil being delivered to streams. Surface soils are eroded from hillslopes and roads, each process having a different risk of being delivered to streams.

Hillslope erosion - Practices which increase surface erosion from hillslopes have the potential to cause adverse effects to water quality and stream conditions where eroded material reaches waterbodies.

Projects which result in removing soil cover on slopes are timber harvest, fuel treatment activities, and forage improvement projects. Reduction of the vegetation and duff from soils has the potential to result in increased erosion of surface soils. Where the eroding soils are adjacent to streams, wetlands, lakes and reservoirs, some of the material may reach the water, effecting the water quality and stream condition. Research has shown that the main factors influencing the rate of surface erosion from harvest units are the percent of the soil cover which is removed, and steepness of the slope. (Swanson and Grant, 1982) The main factors influencing transport of material to streams is the distance and the roughness of the ground between the eroding site and the stream. (WRENS, 1981)

Surface erosion is transported downhill in several ways. Research in the Coast Range (Bennett 1982) shows that the dominant process in areas of less than 60% slope is raindrop splash and freeze/thaw action. Overland flow is was not observed in unburned areas. On areas over 60% slope and on areas that had been burned the dominant transport mechanism was dry ravel. Most of the material moved downslope was coarser fragments, and 65% of the material moved within 24 hours of the burning. The mean distance this material traveled during the 20 month study was as follows: on slopes less than 60%, 1.1 meters; and in areas over 60%, 5.4 meters. This would imply that transport of surface erosion can be mitigated to an insignificant amount by maintaining soil cover characteristics similar to undisturbed ground in areas up to 5.4 meters or approximately 18 feet adjacent to streams.

The number of acres harvested would influence the risk of surface material reaching streams, and the effectiveness of applied BMPs. All alternatives require application of BMPS to control movement of surface erosion to streams, and these types of BMPS are usually very effective. It is estimated that the amount of material reaching the streams from surface erosion would be negligible.

Commercial thinning is not expected to substantially increase surface erosion, as the duff layer is normally retained except on designated skid roads which are treated with erosion control measures.

Roads surfaces - Road use and construction during winter months have the potential to increase movement of road surface materials to streams.

On the Forest many of the roads used as major haul routes during the winter months are adjacent to reservoirs and Class I and II streams. Erosion of road surface material during these times, and delivery of this material to water can be a major source of sediment and turbidity. In many cases the fine-grained material erodes from road gravels and subsurface. The streams most likely to be effected are those in lower elevation watersheds where the geology of the old Cascades has created fine-grained soils, and where roads are used for log haul and recreation during the winter months.

The limited study of road surface erosion indicates that the amounts eroded are highly variable with the type of road surfacing material, the length of time the road is used, and the precipitation patterns during use (Reid 1981). This variability makes quantification of the amounts of m

delivered to streams very rough estimates. All alternatives would apply the same road surfacing measures, therefore, the amount of sediment generated from road surfaces for each alternative would follow the amount of volume harvested. Alternatives K, and A are highest, and Alternatives W, D, and L are lowest.

Sediment Summary - Alternative L has the lowest risk of debris slides because of the low number of acres harvested, and few miles of road constructed. Alternative W is the next lowest, followed by Alternative D. The major differences between W and D is the reduction in risk of sedimentation by protecting Class IV and headwall stream areas in Alternative W. Alternatives J, A, and K have a highest risk. Surface erosion delivery to streams is estimated to be minimal with the application of very effective BMPs. If measures are not effectively implemented and enforced, the amount of sediment from road surfaces could be very high.

Estimates of the total amounts of erosion from roads is included in Table IV-2. These estimates are of erosion, not delivered sediments.

Evaluation of Runoff Patterns

Runoff patterns refers to the quantity of runoff which occurs during different periods of time. Different parts of the runoff pattern are the "peak flows", "low flows", and "base flows". The causes and effects of peak flows are evaluated in the first section below.

For any period, the runoff pattern would be influenced by the intensity and duration of the precipitation, and the capacity of the watershed area to store the runoff. Factors which influence runoff patterns, but which are not appreciably altered by management practices are precipitation patterns, slope of area, and depth of soils. Management activities can change the capacity of the watershed to temporarily store the runoff by changing snowpack temperatures, snowpack water content, condition of vegetation, and miles of streams or ditches carrying runoff. These processes are described in detail below.

Changes in runoff patterns are most pronounced when warm wind and rain-storms occur on saturated snowpacks. These storm events occur commonly in the transient snow zone between October and March. The transient snow zone is generally between 1500 and 4000 feet elevation on the Forest. Under some climatic conditions more snow accumulates and more rain and wind reach the snowpacks in created openings than in adjacent forested areas. The variation in windspeeds between clearcuts and forested areas was confirmed by studies on the Oakridge District (Christner, 1984). As a result of these changed conditions, more rapid snowmelt can occur during rain-on snow events which are commonly accompanied by warm winds from the southwest. Research on rain on snow conditions recorded 21% more "water outflow" from plots in clearcuts than from equivalent forested areas measured at the same time. (Berris and Harr, 1983). This increased snowmelt can translate to changes in peak flows in streams, and subsurface waters.

The potential effects of created openings on runoff patterns is quantified by estimating the ability of the timber stands to intercept snow, rain, and wind. This functioning is termed the "hydrological condition" of the area, and is quantified with the Aggregate Recovery Percent (ARP) method. On this Forest a timber stand is judged to by hydrologically recovered at 25 to 35 years old.

Stream runoff - Timber harvest has the potential to increase peak flows in subdrainage streams, which may result in an increase in erosion of stream banks and substrate. Increases in peak flows sometimes occur where created openings have increased snow accumulation, snow pack water content, and snow pack temperature.

This effect is sometimes considered a cumulative effect, because the peakflows are a product of the cumulative total of the area clear-cut within a sub-drainage. Peak flows is dealt with as a direct and indirect effect here, because it is one component of the cumulative effects discussed below, the other two components being the effects of riparian management, and increases in sediment.

Changes in snow accumulation and melt in subdrainages (median size 2500 acres), may increased the size of peak flows during rain on snow events. Research in the H.J. Andrews Experimental Forest made comparisons between two small subdrainages, one harvested, and one forested, (Watersheds 9 and 10). When air temperatures reached 4 degrees C. and above, the peak flows from the harvested subdrainage were 50% larger than in the forested subdrainage (Harr 1986) While this analysis does not show conclusively that this is attributed to the clearcutting, it indicates that there is a high likelihood that this effect is occurring at this scale.

The relationship between timber harvest and increases in peak flows in larger watershed areas (15,000 to 100,000 acres) has been studied (Christner and Harr, 1982.) The conclusion that there appeared to be peak flows related to the amount of timber harvest is not unanimously supported in the scientific community.

Effects of increased peak flows on stream conditions - Stream conditions and turbidity are influenced by the amount and timing of water flowing through the channels. Increases in peak flows have the potential to adversely affect stream conditions and water quality by increasing the rate of movement of sediments and bedload already in the streams, and by eroding stream channels. For example, currents with velocities above 0.5 ft/sec are capable of moving silt; while flows of more than 1 ft/sec are required to move sand, and currents above 2.5 ft/second can move gravels. (Yates, 1988).

The potential effect of increased peak flows on stream channels is varied, depending on channel characteristics. Several different effects may occur within any area. For example, in low-gradient reaches, where gravels are normally deposited, increased peak flows may cause gravel-size material to move more frequently, resulting in damage to fish eggs deposited in the gravels. Vegetation may take longer to become established on the higher gravel bars, resulting in increased temperatures, and more exposed habitat. Increased movement of bedload material can influence the width and depth of the stream channel under some circumstances.

The potential effects of increased peakflows on steeper gradient streams is the increased scouring of streambeds and banks, resulting in streambank instabilities, and increased turbidity. Debris torrents may be triggered where steep channels have high amounts of gravels. The effects of debris torrents was described in the previous section.

In landtypes with deep seated mass movement adjacent to the stream channels, increases in peak flows have the potential to undercut the toe of the mass movement. In some cases the rate of movement of the unstable area may be substantially influenced by the amount of the toe material which is eroded by the stream. This process has the potential to increase turbidity and downstream bedload. This type of occurrence is limited to a few critical sites on the Forest. The potential for increases in peak flows to result in adverse effects to stream channels and water quality is related to inherent characteristics, and the beneficial use. Sensitivity of the Forests 454 subdrainages were described based on their average slope, the percent in the transient snow zone, and the local beneficial use. Average slope was selected as an indicator of the velocity of runoff, and the distance debris torrents might travel. The existing stream channel condition is important information which should be considered in assessment of the effects of peak flows on stream channels, but which was not available.

It was estimated that hydrological recovery of between 60% and 85% would maintain channel stability, depending on the subdrainage sensitivity. Each subdrainage was assigned a Midpoint ARP as a reference point for assessment purposes. During project implementation a Recommended ARP would be determined based on site specific characteristics, including existing channel conditions. The Recommended ARP can be considered a BMP to distribute timber harvest in order to minimize adverse cumulative effects. The Midpoint ARP is intended to represent an average of Recommended ARPs, used for modelling purposes.

Table IV-5 shows the theoretical hydrological recovery of subdrainages under different alternatives, with all harvest constraints applied. Many of the subdrainages would be maintained above the Midpoint ARP level because of harvest constraints from scenic and wildlife resources. In approximately one-third of the subdrainages, ARP would be the most limiting constraint. These are primarily very sensitive subdrainages where the Midpoint ARP is 75% to 85%.

Table IV-5. Subdrainage Hydrologic Recovery

	Alternatives [1]						
% Recovery	NC [2]	K	A	J	W	D	L
95-100%	NA	36	38	42	43	51	62
90-94%	NA	25	32	29	39	35	98
85-90%	NA	53	41	64	69	76	109
80-85%	NA	97	92	90	112	83	99
75-79%	NA	96	96	108	103	106	47
70-74%	NA	85	93	66	51	53	10
65-69%	NA	33	33	26	10	21	4
60-64%	NA	3	3	3	1	3	0

[1]Values presented are the number of subdrainages which fall in each category throughout the 1st decade, considering Forest and Non-National Forest land, and all land allocations
[2]No data is available. Alternative NC would be expected to cause the greatest number of subdrainages to fall into the lower 3 hydrologic recovery groupings.

At the watershed scale, the potential for adverse effects from peak flows was assessed based on an aggregation of the subdrainage Midpoint ARP levels. A comparison was made of the number of acres theoretically available for harvest in each subdrainage while meeting Midpoint ARP, with the number of acres scheduled for harvest by FORPLAN in each watershed. Table IV-6 indicates which watersheds would have the Midpoint ARP levels exceeded in all subdrainages, if the acres scheduled by FORPLAN were harvested. The Midpoint ARP levels would be exceeded by 1 to 12%. Where the Midpoint ARP levels are exceeded, there is a higher risk that stream channels and beneficial uses would not be protected.

FORPLAN results showed that harvest could be distributed to the less sensitive watersheds. The DEIS assumed that harvest would be distributed equally across watersheds, resulting in more of the sensitive watersheds being assessed as higher risk. In the FEIS analysis, FORPLAN may have been able to distribute the same amount of acres across watersheds to result in even less risk than is indicated here, however due to limitations on model size this was not feasible at this time.

Alternative K has 3 watersheds totalling 7% of the Forest in an increased risk of peak flows. Alternatives A, J, and D have approximately the same number of watersheds, but which cover less area of the Forest. Alternative L has one watershed at which does not meet Midpoint ARPs, and this is less than 1% of the Forest. All the watersheds in Alternative W meet the Midpoint ARP levels because this was one of the objectives of the Alternative.

Table IV-6. Watersheds at Risk of Peak Streamflow Increase

		Alternatives [1]						
District	**Watershed Name**	**NC [2]**	**K**	**A**	**J**	**W**	**D**	**L**
Detroit	Little N. Santiam	NA						
	Detroit Tributaries	NA						
	Blowout	NA						
	Lower N. Santiam	NA						
	Upper N. Santiam	NA						
	Breitenbush	NA						
Sweet Home	Quartville	NA	X	X			X	
	Middle Santiam	NA						
	South Santiam	NA						
	Calapooia/Wiley	NA	X	X			X	X
	Canyon	NA						
	Hackleman	NA						
McKenzie	Deer	NA						
	Scott	NA					X	
	Lower Horse Creek	NA						
	Upper Horse	NA						
	Upper McKenzie	NA						
	Wilderness Lakes	NA						
Blue River	Blue River	NA			X			
	Lookout	NA						
	Lower McKenzie	NA			X			
	Quartz Creek	NA						
	S.F. McKenzie	NA						
Lowell	Fall Creek	NA	X					
	Winberry Creek	NA						
	MF Willam Tributaries	NA						
Oakridge	Lower NFMF Willamette	NA						
	Upper NFMF Willamette	NA						
	Salmon Creek	NA						
	Salt Creek	NA						
Rigdon	Hills Creek	NA					X	
	Lower MF Willamette	NA						
	Upper MF Willamette	NA						

[1]"X" indicates that the watershed has a high risk of experiencing increased peak streamflows as a result of activity planned under the alternative.

[2]No information is available. Alternative NC would be expected to cause a greater number of watersheds to experience a high risk of increased peak streamflow and landslide incidence then Alternative B-Departure, due to having a greater amount of timber harvest and road construction.

Subsurface runoff - Timber harvest has the potential to alter the amount and timing of water entering the soil, with subsequent indirect effect on several watershed processes.

Mass movement - Snowmelt in created openings has the potential to result in increased mass movements due to increased subsurface soil moisture during rain-on-snow events.

Research on mass movements confirms that soil moisture is one factor influencing the rate at which mass movements occur. The influence of these factors such as root strength, soil shear strength, and slope, is also important. Theoretically increases in the subsurface water during the periods of rapid snowmelt and runoff could result in increases in mass movements on potentially highly unstable slopes. The risk of this occurring has been described with the ARP method by some hydrologists. The scientific community is not unanimous in their agreement that hydrological recovery of a watershed is the appropriate tool for describing the risk of mass movements, or that control of hydrological recovery will effectively control the frequency and size of mass movements.

Where mass movements occur in clearcuts, it is difficult to ascertain whether the movement is in response to increased soil moisture, or to decreased root strength. Where root strength is a factor, mitigation measures to maintain root strength on specific site can be prescribed. Very little research is available on the proportion of mass movements which are initiated by increases in subsurface water alone, without the influence of decreased root strength.

In this analysis the risk of increased mass movement is evaluated based on the landtypes where the activity occurs, as described in the section above on Sediment.

Aquifer recharge - Timber harvest has the potential to reduce summer low flows, and aquifer recharge during summer months.

Research studies indicate timber harvesting generally increases annual water yields. This is due primarily to reduced evapotranspiration. Harr (1983) developed a regression equation for use in estimating potential increases in annual water yield, which can be expected from clearcutting in western Oregon and Washington based on research results in experimental watersheds. Initial on-site increases of up to 20 inches are predicted, though they completely disappear in about 27 years. The equation predicts a smaller annual water yield increase when annual precipitation is less. Harr estimated that sustained increases in annual water yield from most large watersheds in western Oregon and Washington subject to sustained yield forest management are, at best, three to six percent more than flows from an undisturbed forest. Kattelmann, et al. (1983), estimated similar maximum potential increases in Sierra Nevada watersheds if minimum standards for all applicable laws were followed. However, they concluded that the typical increase in a large watershed drops to approximately one percent when constraints are imposed to meet other resource demands. A similar scenario is expected in Region Six National Forests due to multiple use considerations. Other factors which further minimize potentials to effect changes in streamflow are high natural variability, flow measurement accuracy is within five percent at best (so potential changes are less than what is measurable in large watersheds), and most of the flow increases occur when it is needed the least or is unusable (during spring runoff on the eastside and during fall storms on the westside.)

Research generally shows increases in summer flow result on-site immediately after harvest in western Oregon. However, studies in the Rocky Mountains (Troendle, 1983) showed no change in late summer streamflow following timber harvest, despite annual increases. (These increases occurred during spring snowmelt.) In large watersheds subject to sustained yield harvesting, summer flow increases are temporary and not expected to be measurable at downstream locations.

Effects of harvesting timber on groundwater recharge and aquifers are similar to effects on streamflow, except for timing differences; eg., aquifer responses are typically slower and fluctuate less than streamflow.

The above-mentioned research findings indicate timber harvesting on a sustained yield basis, as is presently practiced and would be practiced under any selected forest plan alternative, is expected to have a negligible, unmeasurable effect on downstream aquifers. There is no realistic potential to modify timber harvesting to measurably increase downstream water supplies. This assumes management practices are conducted in a manner which reasonably maintains water infiltration characteristics, as is typical of current practices on National Forest System lands. BMPs would ensure adequate infiltration characteristics are maintained. Only if extensive, contiguous areas were compacted would infiltration be expected to be reduced so as to adversely effect downstream aquifers.

Road interception - Road construction has the potential to increase the rate at which subsurface water reaches stream channels.

Road construction has the potential to alter natural drainage patterns, causing an increase in the interception of subsurface flows and acceleration of the delivery of subsurface runoff to the small stream channels. (Megahan) These effects most frequently occur in areas with high intensity precipitation and dissected topography.

As subsurface flows are delivered to stream channels, they may increase the flow within channels, having the same effect as described for increases in peak flows due to rapid snow melt. These effects can be compounded during rain-on-snow events in the transient snow zone, when rapid melt of snow accumulated in the road opening may reach the stream channel.

The extent to which this occurs would increase with the miles of roads constructed and timber harvested in the transient snow zone being highest in Alternative K, and A, and lowest in Alternative L and W. BMPs for road design can be effective in providing "relief" culverts, which drain water from ditches before it reaches the streams. These relief culverts, or cross-drains, direct the flow onto the slope below the road, where it infiltrates into the soil.

Runoff Summary - Timber harvesting and road building can have potential effects on patterns of snowmelt, stream runoff, and subsurface water levels, with indirect effects on stream channels. Alternatives which harvest the most acres generally have a higher risk of adverse effects from changes in runoff patterns. Alternative K results in 7% of the Forest area being at a hydrological recovery level with a risk of damaging stream channels.

Water composition

Water on the Forest contains very low concentrations of most chemicals, nutrients, bacteria, and other micro-organisms. Waters of the McKenzie River, Little North Santiam River and of Waldo Lake are widely known for their clarity and purity. Future Forest activities have the potential to change this water quality. To protect beneficial uses numerical water quality standards have been established for Dissolved Oxygen, Ph, and fecal coliform. In additions the State water quality standards prohibit bacterial pollution, fungi, tastes and odors which are deleterious to beneficial users. Numerical standards for some chemicals have been established by EPA for drinking water.

Timber Management - Changes in the chemical concentrations of water have the potential to occur where timber harvest occurs, where fertilizers are applied, and where chemicals are used for vegetation or pest control.

Research has shown that removal of forest trees sometimes results in changes to the chemical composition of water flowing from the area. Studies on the Umpqua N.F., just south of this Forest, found that clearcutting resulted in increases in total dissolved nitrogen (N) from a watershed that had been 77% clearcut, but that at no time did the increased chemical levels degrade water quality, even under the relatively strict drinking water criteria of EPA. (Adams and Stack, Draft, 1989).

Other increases from the clear-cut watershed were observed in ortho-phosphate, total dissolved phosphorus, calcium and potassium concentrations. No effect of beneficial uses has been observed from these increases.

All alternatives propose to fertilize Douglas-fir stands with urea fertilizer annually, when the stands are approximately 30 years old. The potential for fertilizer application to adversely affect water quality has been monitored during the past 10 years on a number of projects. When applied with BMPs, including avoidance of applying it to streams with beneficial uses, the increases in nitrogen would have no known effect on beneficial users.

Other timber management projects which may include use of chemicals is the management of competing and unwanted vegetation. Current direction states that the preferred methods of treatment of competing vegetation is prevention and non-herbicide tools; and that herbicides will be used only when other methods are ineffective or will increase project cost unreasonably. (FEIS Unwanted and Competing Vegetation, and Mediated Agreement.)

Chemicals such as fertilizers, pesticides, and petroleum products can reach streams through accidental spills, particularly along the railroad and major highways which bisect the Forest. Contaminants may also reach streams due to application to areas which contribute surface runoff to streams. Mitigation practices on the Forest include a Willamette N.F. Spill Plan, and existing laws and regulations. Herbicides, in particular, are not applied in the riparian areas adjacent to perennial streams. The chemical composition of water is not expected to vary by alternative.

Recreational Use - Intensive recreation use may increase levels of bacteria and nutrients, and chemicals in waters. In many cases one type of beneficial use may create risks of damage to other types of beneficial users. Recreation programs will be managed with BMPs.

Many recreation activities are located on or near streams, lakes, and reservoirs of the Forest. These activities include no-trace dispersed camping, use of livestock for pack animals, use of developed campgrounds, fishing, stream and lake swimming, use of motorized boats on lakes, and ORV use in reservoir draw-down zones. Designation of Wild and Scenic Rivers usually increases national attention and recreation use. Increased demand for water related activities is expected in all alternatives.

Uses such as dispersed camping, river running and camping, and swimming increase the risk of water being contaminated by human and animal wastes, bacteria, viruses and parasites which people carry. Gastrointestinal illness and skin diseases have the potential to increase from drinking and swimming in contaminated water. The magnitude of contamination and effect on users is not known, but experience on other heavily used recreation rivers suggest that crowding of recreationists would be noticed before water contamination is recognized as a problem. Effects would be greatest in late summer when water is relatively warmer and recreation users increase. Use of chemicals, such as detergents, increases the risk of contaminating lakes where water is not highly aerated and is infrequently replaced.

Concentration of wildlife, livestock, and saddle or packstock can have local effects on the sanitary quality of water. All of the Alternatives have similar chances of concentrating animals near streams or lakes.

Developed campgrounds are designed with measures to control water contamination, and water quality of water supplies for these campground are checked frequently in compliance with the Safe Drinking Water Act. The risk of water contamination increases where developed campgrounds do not have water supplies, and users are more likely to use local streams and lakes for their water needs.

Motorized boats are currently allowed on Waldo Lake, Big Lake, and reservoirs. The potential exists for accidental contamination, such as fuel spills on these waters. The decision to allow or prohibit this type of use is made at the District level, based on public input and environmental assessment

Reservoirs are heavily used for recreation throughout the year, for both fishing, and in some locations, for Off-Road Vechicles (ORV) use in the draw-down zone. ORV use has the potential to decreased the recovery of vegetation on the shallow parts of the draw-down zone (less than 30 feet below high water line.)

Water Yield - Quantity

Forest management practices have the potential to change the quantity of water flowing from the forest.

Watershed research consistently shows temporary increases (5-20 years) in total annual water yield and summer flow from completely deforested land (Harr 1976, 1982). Removal of trees reduces transpiration (the use of soil water by plants) and more water is available for streamflow. Increased water yield is considered a benefit when water supply is limited. Harvest areas, however, combine with undisturbed and reforested areas in large (40 square miles and greater) watersheds to mask streamflow increases. Harr, Fredriksen, and Rothacher (1979) maintain that water yield increases from sustained timber harvest would be smaller than the 5% accuracy of streamflow measurement. Harr (1976) used data from previous research to show that this would be true even when 20% of large watersheds were harvested continuously each decade. Timing of increases further reduce their benefits. None of the alternatives exceed 20% harvest per decade in drainages larger than 40 square miles, and no significant increases in water yield are expected. Chapter III, Water includes a discussion of water supply.

Potential Cumulative Effects

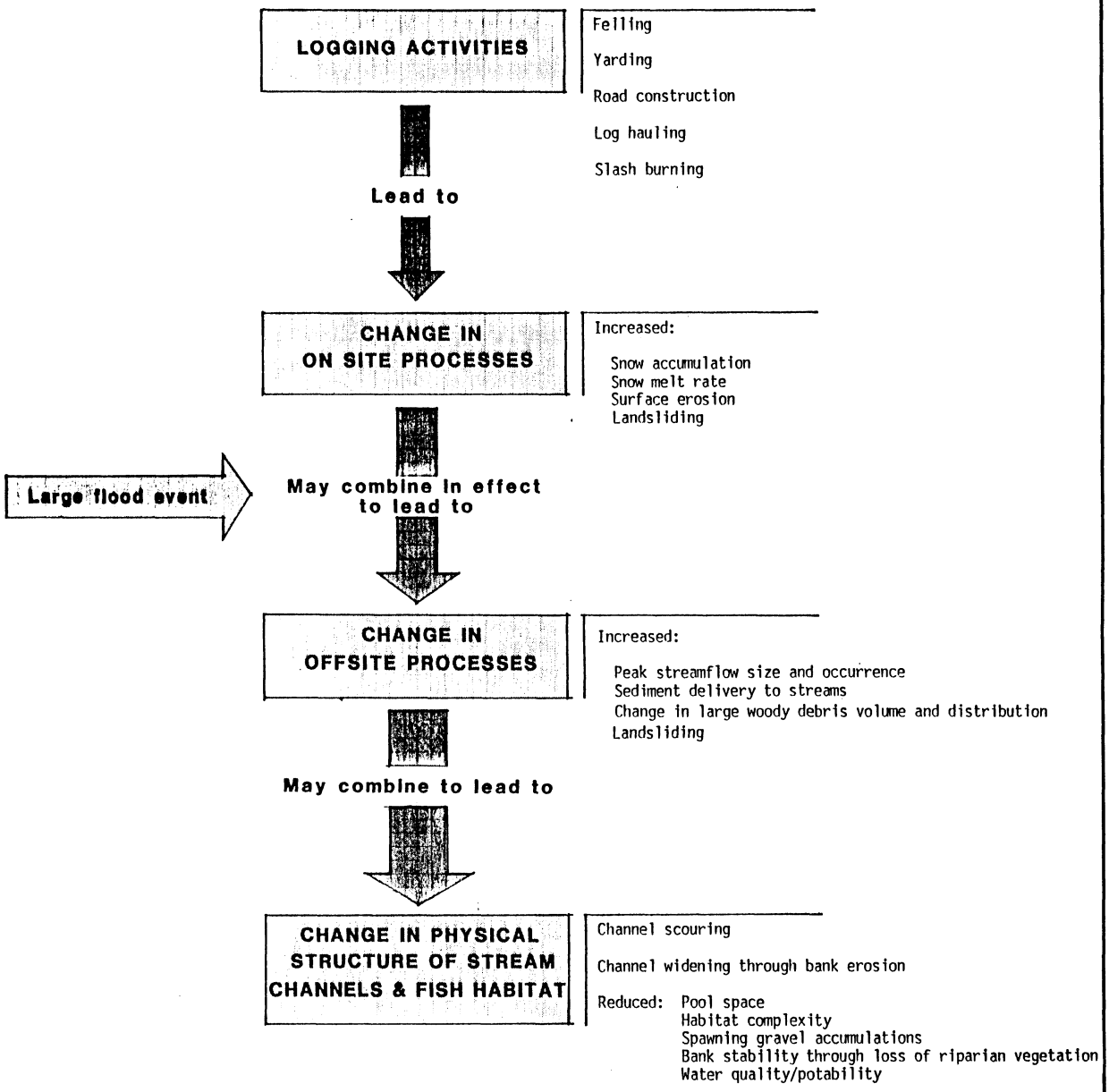
Concepts - The National Environmental Policy Act (NEPA) requires that the Forest avoid "unintended consequences" as a result of land management activities and to be appropriately conservative where knowledge is imperfect. Our knowledge in terms of assessing cumulative effects is limited. There is no consensus within the research community that cumulative effects on water occur or can be demonstrated (Grant 1986). The "state of the art" in assessing the risk or reality of cumulative effects on water is in an infant stage. Techniques for assessing cumulative effects are currently being developed by the scientific community.

The cumulative effects concept is based on the idea that individually minor actions may have additive impacts when viewed on a watershed scale. In this case, changes in riparian conditions, rates of sediment input, and peak flows may not by themselves result in adverse effects, but the changes when considered together, would influence the risk of adverse cumulative effects.

The cumulative effects concept is also based on the assumption that some impacts associated with management activities can be imperceptible for many years and then become of consequence when a large precipitation and flood event act on the altered watershed condition (Grant 1984, Lyons and Beschta 1983). Projecting effects into the future assumes a similar sequence and magnitude of flood events as has occurred in the past. An important assumption is that current channel condition, erosion levels, and hydrologic recovery can be used to predict the continuation of existing effects, or the likelihood of a watershed to experience effects in the future.

Figure IV-2 displays a theoretical linkage of management activities to cumulative, downstream effects on water quality, physical stream characteristics and functions and the fish populations which depend on aquatic resources.

Figure IV-2. Thoretical Linkages to Cumulative Effects



1/ Adapted from Grant 1984 and Grant 1986, "The Management Induced Disturbance System."

Types of Cumulative Effects - Cumulative effects occur over time, across geographical areas, and between several physical processes. In this analysis the potential cumulative effects of past, present, and reasonably foreseeable practices on all land ownerships within the forest boundaries are considered. The cumulative effects of changes in riparian condition, sediment inputs, and runoff patterns are considered on two different scales, the subdrainage scale, and the watershed scale.

There is a low risk of cumulative effects to water composition that are not related to sediment. Effects to water composition which do occur are likely to be direct or indirect effects.

Because of the complex interaction of the physical processes, the potential cumulative effects may become manifest in a number of different ways.

Alternatives which heighten the risk of peak streamflows and landsliding, with lowered inputs of LWM to provide energy dissipation and stream channel stability, may to varying degrees, aggravate existing bank instability and sediment deposition.

Low-gradient streams such as Salmon Creek, parts of the Breitenbush River, the Middle Santiam, and the Middle Fork Willamette may begin to meander or braid more due to changes in the amounts of gravel they transport, changes in flow patterns, and changes in the amounts of LWM. Channel changes, may have subsequent effects on the loss of productive riparian areas, and the quality of aquatic habitat.

Some streams like Fall, Winberry, and Hills Creek have bedrock dominated channels. Increased peak flows and landsliding would likely produce higher suspended sediment and turbidity loads, and reduce the stability of large woody debris. There may be an increase in channels scouring down to bedrock, resulting in a loss of fish habitat.

In watersheds with a high risk of cumulative effects Fish hatcheries and potable water users downstream may be required to increase the amount of water treatment, or limit their use to fewer nonturbid periods. Increases in turbidity may occur from the cumulative increases of debris torrents and channel scour.

Risk Categories - The assessment of the risk of cumulative effects for all watersheds shown in Table IV-8 is based on the combined direct and indirect effects of changes to inputs of LWM, inputs of sediment, and increases in peak flows. Within the harvest constraints and allocations proposed by each alternative, the effects have been minimized by assuming that timber harvest would be distributed according to the sensitivity of the watersheds.

Each watershed is assigned a risk rating of "High", "Moderate" or "Low", to indicate the relative risk of adverse effects. The assignment of risk is applied in Appendix B. A watershed with a High rating would still be expected to support existing beneficial uses, but the amount and relative long term stability of those uses would be lessened. A substantial number of subdrainages within the watershed would be expected to experience a management-induced decline in beneficial use levels if a 10 to 20 year (or larger) rain-on-snow flood event occurs. A watershed receives a Moderate rating if it is anticipated that a management induced reduction in beneficial uses would occur in a small number of subdrainages as result of a 10-20 year (or larger) rain-on-snow flood event. An Low rating is assigned where planned activities represent a low risk to water resources.

Table IV-7. Cumulative Effects Assessment [1]

			Alternatives						
District	Watershed Name	Percent of Forest	NC [2]	K	A	J	W	D	L
Detroit	Little N. Santiam	2	NA	L	L	H	L	L	L
	Detroit Tributaries	2	NA	L	M	L	L	L	L
	Blowout	2	NA	M	L	L	L	M	L
	Lower N. Santiam	2	NA	L	M	L	L	L	L
	Upper N. Santiam	3	NA	L	L	L	L	L	L
	Breitenbush	3	NA	M	M	H	L	L	L
Sweet Home	Quartville	2	NA	H	H	M	L	H	L
	Middle Santiam	2	NA	M	M	M	L	L	L
	South Santiam	4	NA	M	H	M	L	L	L
	Calapooia/Wiley	1	NA	H	H	L	L	H	L
	Canyon	2	NA	M	L	L	L	M	L
	Hackleman	2	NA	L	L	M	L	M	L
McKenzie	Deer	2	NA	M	L	L	L	L	L
	Scott	2	NA	L	L	L	L	H	L
	Lower Horse Creek	1	NA	M	M	H	L	L	L
	Upper Horse	4	NA	L	L	L	L	L	L
	Upper McKenzie	7	NA	L	L	L	L	L	L
	Wilderness Lakes	1	NA	L	L	L	L	L	L
Blue River	Blue River	2	NA	H	H	H	L	L	L
	Lookout	1	NA	L	L	L	L	L	L
	Lower McKenzie	1	NA	H	H	H	L	L	L
	Quartz Creek	1	NA	M	H	H	L	L	L
	S.F. McKenzie	6	NA	L	L	L	L	L	L
Lowell	Fall Creek	4	NA	H	L	L	L	H	L
	Winberry Creek	1	NA	M	M	L	L	L	L
	MF Willam Tributaries	3	H	H	H	L	M	L	L
Oakridge	Lower NFMF Willamette	5	NA	H	H	H	L	L	L
	Upper NFMF Willamette	4	NA	H	H	H	L	L	L
	Salmon Creek	5	NA	H	H	L	L	M	L
	Salt Creek	4	NA	L	M	L	L	L	L
Rigdon	Hills Creek	2	NA	M	L	L	L	H	L
	Lower MF Willamette	6	NA	H	H	M	L	L	L
	Upper MF Willamette	6	NA	M	M	L	L	L	L

[1]First decade, National Forest and private land . Risk of adverse watershed impact: H = High; M = Moderate; L = Low.

[2]NA = Data Not Available; could not be reasonably estimated since the NC Alternative (No Change) is based on a significantly different set of assumptions than the other alternatives and could not be modeled with the current Willamette National Forest FORPLAN model. The effects under this alternative would be expected to be greater than Alternative K.

Effects of Non-National Forest Lands - Harvest plans for the next decade for non-National Forest landowners within the Forest boundary have been estimated for calculation of the current and future hydrologic recovery of these lands. No attempt was made to project hydrologic recovery beyond the first decade or to estimate erosion yields from other ownerships.

The effects of private land outside the Forest Boundary was considered, but not quantified. Several alternatives propose activities which constitute a low risk within the Forest. These alternatives would not add to the risk off-forest appreciably. In most watersheds the rate of off-Forest timber harvest in the next few decades would be less than historic levels. Consequently, hydrologic recovery would increase while the rate of road construction and landsliding should decline, resulting in a diminishing sediment yield in major rivers off Forest over time.

Distribution of harvest areas and road construction within major drainages is not subject to Standards and Guidelines on non-Federal lands, and management practices can vary between Federal agencies. Forest project plans would consider activities of others within major watersheds and subdrainages during cumulative effects analyses, and mitigate the effects of increased peak flow and sediment mainly by dispersion of activity. Mitigation would be more difficult where activities on non-National Forest lands vary the most from the assumptions used in this chapter. In those cases, peak flows and sediment yields may increase, with the same effects described earlier. There is little opportunity to reduce water temperature, or improve water yield or chemical composition of water of National Forest streams in order to offset changes which might occur on adjacent lands. For example, providing more than existing effective shade on National Forest streams would not reduce water temperature.

Dispersed harvest on Forest land with intermingled non-National Forest ownerships is expected to help reduce the environmental effects of all alternatives on peak flows, sediment, and fish habitat.

Cumulative Effects Summary - In summary, Alternatives NC, followed by A and K represents the greatest short term risk of cumulative effects to watershed resources, with 29% of the Forest in High Risk category due to the greatest harvest of potentially unstable soils, riparian management at minimum levels, and low emphasis on stream Class IV protection. Alternative J results in less risk, followed by Alternative D. Alternatives L and W represent the lowest risk of cumulative effects to watershed resources. The percent of the Forest in each category is shown in Table IV-8.

The degree of uncertainty which exists in predicting cumulative effects in the short-term, is amplified greatly when projecting to the fifth decade. By the fifth decade, erosion levels in most Alternatives is approximately equal to or less than that for Alternative D in the first decade. In addition, by the fifth decade, the proportion of timber volume coming from clearcut harvest in the transient snow zone would be reduced. Consequently, hydrologic recovery levels would increase.

Table IV-8. Cumulative Effects Summary

	Alternatives						
Risk Category [2]	**NC [3]**	**K**	**A**	**J**	**W**	**D**	**L**
High %	NA	29	29	18	0	12	0
Moderate %	NA	27	25	17	0	10	0
Low %	NA	44	47	65	100	78	100

[1]National Forest and private land.
[2]Values presented are the percent of the Forest in in each category in the 1st decade.
[3]Data is not available. Alternative NC would be expected to produce greater effects than Alternative B-Departure.

Mitigation Measures for Water

Mitigation of the potential effects are summarized in the following sections. Mitigation measures would be used to avoid or repair direct, indirect, and cumulative effects already discussed.

Mitigations used to meet water quality objectives usually fall into the category of Best Management Practices (BMPs). An agreement between the Forest Service and Oregon Department of Environmental Quality establishes the use of (BMPs) by National Forests as the means to control nonpoint sources of pollution from silvicultural activities. The agreement is authorized under the Federal Clean Water Act (Public Law 92-500 as amended). Best Management Practices would be selected and tailored for site-specific conditions to arrive at project level BMP's for the protection of water quality. See BMP Appendix H for a discussion of specific BMPs, and the implementation process.

Some of the mitigations below are discussed in terms of "Effectiveness". Evaluation of BMP effectiveness is part of the format described for BMPs in Appendix H. This appendix includes criteria used to describing the effectiveness of the BMPs as High, Moderate, or Low.

Mitigation in Riparian Areas - Measures to mitigate potential increases in stream temperatures include implementation of timber harvest prescriptions which would not remove excessive amounts of shade; and to revegetate riparian areas with rapidly growing hardwood species to provide additional shade in a minimum amount of time. On larger streams, it is important that taller conifer species are also established in order to shade streams from mid-day sun.

Measures to minimize direct disturbances to stream channels would require use of yarding equipment which is capable of providing adequate suspension of logs over the streambanks. Measures to minimize streambank disturbance during road construction are to select stream crossing sites which require only small cut and fill slopes, to design road crossings perpendicular to the stream, and require equipment which is capable of moving around the site without excessive disturbance. The potential for streambank erosion following culvert placement would be mitigated by ensuring site characteristics are considered, and by using material to stabilize streambanks where needed.

All alternatives also propose to replace LWM in order to rehabilitate stream condition and aquatic habitat degraded by past practices, and where operation of heavy equipment is feasible. The rehabilitation practice of placing LWM is most successful in streams with low gradients, and watershed areas of less than 50,000 acres. This mitigation would be implemented in approximately 15% of Class I and II streams, and could not be accomplished in less than a decade. This is a relatively new practice. Its long term effectiveness is still being evaluated.

Actions in floodplains and wetlands are required to minimize impacts to those areas, under Executive Orders 11988 and 11990. Where adverse effects are anticipated, they must be formally declared with notification to the public.

Executives Order No. 11988 requires that the agency take action "to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Executive Order No. 11990 requires that the agency take action "to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands."

In addition to the legal direction concerning floodplains and wetlands, riparian areas and fish habitat are protected through reduced harvest entry, directional falling for protection of streams, and maintenance of the current amount and future supply of stable large woody debris in streams. These practices have been found to be necessary and effective in the maintenance of stream functions, fish habitat, and the productivity of the aquatic ecosystem (Keller and Talley 1979; Brown 1972; Harmon et al. 1986; Martin et al. 1981). When catastrophic events occur, or when preventative measures have failed, riparian areas adjacent to fishery (Class I and II) and nonfishery streams would be rehabilitated. Common measures are the planting of grass and tree species with rapid growth characteristics to regain bank stability, shade and reduce erosion. Streams are rehabilitated or improved by introducing boulders, gabions, or large woody debris to increase long-term channel stability and fish habitat. Accumulations of woody debris limiting access to upstream areas for fish, threatening improvements, or excessively degrading water quality, would be removed.

Mitigation of Sediment - The potential to increase the occurrence of debris torrents can be mitigated by retaining the root strength of live trees in areas of potentially highly unstable sites as identified during project planning in the field. The area and number of trees to be retained would be based on a prescription which considers the interaction of root strength with soil type, geologic characteristics, the role of groundwater and other influencing factors. These prescriptions should be more conservative when potentially unstable areas are in close proximity to a stream, wetland, lake, or reservoir. Alternatives which propose specific measures which would be highly effective are Alternatives W, and L. The other alternatives propose measures that provide a lower probability of effectiveness.

Mitigation measures used to minimize the rate at which debris slides occur from harvest units and from roads range from measures that have a high probability of effectiveness to those that have a low probability of effectiveness. Measures to mitigate the potential for increases in the rate at which debris torrents travel through Class III and IV streams to Class I and II streams also have a range of effectiveness.

The frequency of debris torrents moving down steep, headwater stream channels, can be mitigated by requiring retention of LWM in headwater channels. This includes maintaining existing instream wood along Class III and IV streams, and provisions to ensure the future recruitment of LWM along potentially highly unstable, and moderately stable Class IV streams. Maintaining the near background levels of LWM in these streams would maintains the current rate at which debris torrents reach Class I and II streams. This measure is required and modelled in alternatives W, and L.

The potential for increases in debris slides and torrents from new roads would be mitigated with measures commonly recognized as Best Management Practices. These practices include selection of stabile of road locations; design of appropriate road widths and compaction standards; installation of special drainage structures where needed; ensuring ditches, stream crossing culverts, and "cross-drain" culverts are maintained. It is estimated that these practices can improve the stability of the roads by 80%

when compared to roads constructed between the early 1960's and the mid-1970's with most of the increase due to increased compaction requirements for fills, and by ending sidecasting practices. Improvements in road construction BMPs are required in all alternatives.

The potential debris torrents from existing roads would be mitigated by stabilizing road fills, either through pulling back the uncompacted material, improving drainage around the fills, and providing additional surface stabilization where appropriate. These projects are costly, but effective, and are required in all alternatives.

Mitigation of surface erosion from slopes is accomplished by measures which retain or replace soil cover. During timber harvest the type of yarding systems, and the fuel reduction practices used can make large differences in the amount of soil cover removed. The potential for surface soils to be transported to streams can be mitigated to negligible levels by ensuring that streamside ground vegetation and woody material is maintained.

Numerous methods to provide stable road surfaces are available, and more are being developed. Practices such as asphalt paving are very effective. Less expensive materials are also available to provide stable surfacing during the months when the road is being used for haul. The use of low-pressure tires on trucks can provide substantial reductions in the amount of sediment generated from road surfaces. The use of contract clauses to restrict the season of haul is also an option for any project, where road conditions and proximity to streams would create turbidity in excess of State Water Quality standards.

Introduction of sediment from the road system is an important effect to mitigate. Roads are made more erosion resistant by addition of surfacing rock. Erosive sites are mulched, fertilized, and seeded with grass species. Ways to reduce the amount of surface erosion and risk of landsliding associated with road construction include: spacing, sizing, and location of drainage culverts; stabilizing cut and fill slopes; inspecting and cleaning ditches and culverts; building full bench roads and eliminating side cast waste where slopes exceed 55%.

Mitigation of changes in runoff patterns - There are few measures to mitigate the increases in rates of snow accumulation and melt in clear-cuts, and its subsequent effects. The most direct method is to control the rate at which clearcuts are created within an area influencing a stream channel. This has been done in the past, and would continue to be done, using the analysis method of Aggregate Recovery Percent (ARP). ARP is a tool to assess the hydrological recovery of an area. Hydrological recovery refers to the recovery of the vegetation's ability to intercept warm winds and rains during warm rain-on-snow events. This mitigation measure is discussed in additional detail under the section on Evaluation of Runoff Patterns, in the Direct and Indirect Effects Section. This practice is considered a BMP to respond to the potential for adverse cumulative effects.

Measures to mitigate the potential for increased stream flows to increase stream scouring and down-cutting stream channels is to maintain historic amounts of large wood within the channel. Up to 80% of the stream energy is dissipated while passing over log steps. (Keller and Swanson, 1979). This level of mitigation does not reduce the risk of increases in stream channel scour during increased peak flows when compared with natural conditions, but would not add additional risk of channel erosion. Where past practices have removed wood from streams, the increased peak flows have potential to decrease stream channel stability.

Many design techniques are available to mitigate potential adverse effects of road runnoff. These designs are commonly implemented BMPs, and include the use of frequent cross drains between stream crossings to disperse runoff which has collected in the ditch before it reaches the stream.

Professional knowledge of current conditions, subdrainage sensitivity, and hydrologic recovery would be used to minimize the risk of negative consequences by dispersing harvest activities to the subdrainages in the best condition. In some instances, subdrainages would be scheduled for some harvest entry, for the express reason of collecting Knutson-Vandenberg funds (generated from timber sale receipts) for the purpose of rehabilitating and improving problem areas.

Planning at the project level is the most appropriate for a focused cumulative effects analysis and site-specific design of mitigation measures and Best Management Practices. The attributes and relative sensitivity of areas within the subdrainage would be analyzed for cumulative or direct effects from past management and projected to options for future management based on the most current knowledge, management direction and desired condition of aquatic resources. Through the use of an interdisciplinary process, trade-offs between management options and relative risk of effects would be assessed. As a result, a site-specific reasoned decision which best meets multiple-use goals and mitigates or avoids direct or cumulative effects would be implemented.

Mitigation of changes to water composition - Potential changes to water chemistry which have adverse effects on beneficial uses are limited primarily to accidental spills of material. The Forest maintains a Spill Incident Response Plan, to deal with these situations. Efforts would be taken during projects such as application of fertilizer to minimize the risk of adverse spills of this material.

Measures identified in the FEIS for "Unwanted and Competing Vegetation" and the Mediated Agreement would be applied during projects of this type.

Mitigation of Cumulative Effects - Mitigation of direct effects is the primary method of ensuring that cumulative effects do not have significant impacts. The practice of dispersing harvest activities over time and throughout the landscape (Christner 1982; Rice 1980) is one means of mitigating some of the direct, indirect, and cumulative effects. According to Rice (1980) any other approach "cannot be supported by current knowledge concerning the propagation of flow or sediment in steep, rough, natural channels."

Monitoring of Mitigations - Monitoring would be the principal means by which the Forest would assess whether the Standards and Guidelines are being implemented as prescribed, as well as if the results of that implementation are producing the desired and predicted effects. The implementation of the S&Gs would be monitored through activity reviews and water quality monitoring of unusual or innovative projects. Water temperature would be monitored through long-term trend stations.
A major focus of the monitoring effort for water resources would center on testing the accuracy of the assumptions driving the cumulative effects assessment. A major assumption was that current channel condition, erosion levels, and hydrologic recovery could be used to predict the continuation of existing effects, or the likelihood of a watershed to experience effects in the future. By testing the assumptions, more effective and efficient mitigation measures can be used.

Relationships With Other Agency Plans or Policies for Water

Implementation of the State Water Quality Management Plan on lands administered by the U.S. Department of Agriculture--Forest Service (USDA Forest Service) is described in a Memorandum of Understanding (MOU) between the Oregon Department of Environmental Quality (DEQ) and USDA Forest Service (2/79)), and "Attachment A" referred to in the MOU (Implementation Plan for Water Quality Planning on National Forest lands in the Pacific Northwest 1978). This MOU and plan provide the basis for the interagency agreement, whereby the Governor of the State designates the Forest Service as the implementing agency for nonpoint source pollution control on lands under its jurisdiction.

This agreement has been updated with a Memorandum of Agreement (MOA) 1990, between the DEQ and USDA Forest Service, pursuant to Section 319 of the Clean Water Act.

The 1979 agreement provides for annual meetings between Region 6 and the DEQ to evaluate the program and progress being made and provides the basis for recertification by the Governor. Available monitoring information is reviewed, revisions, or additions to the best management practices are addressed, progress on problem identification and treatment is provided, and reports are written and submitted by the State to the Environmental Protection Agency (EPA).

In compliance with Section 319 of the Clean Water Act DEQ has issued the "Oregon Clean Water Strategy" to provide a strategic management plan for the prevention and correction of non-point source water quality problems. The Forest would work with DEQ to resolve the water quality status of waters on the Forest.

The Alternative development has been coordinated with the Basin Plans of the Oregon Water Resources Commission for the use and control of the water. The commission has restricted use of the water in most of the major streams and all of the tributaries, and most of the natural lakes on the Forest, to recreation, instream and low consumption uses. In addition the Commission has established minimum perennial streamflows in proximity to the Forest Boundary on many of the rivers flowing off the Forest. Streams within nearly all of the Forest contributes to the flows at these points, although many of the flows are controlled by reservoir dams.

Incomplete or Unavailable Information

Assess the relationships between rain on snow events, the hydrological recovery concept, peak flows, and channel stability.

Determine the amount, sizes and characteristics of timber in riparian areas needed to provide for in-stream large woody debris recruitement.

Improve knowledge of interaction of riparian conditions, peak flows and increases in sediment on water quality and channel stability.

Improve understanding of baseline stream and lake water quality and channel conditions in areas with differing geology and use patterns.

Determine cumulative effects of forest fertilization on water quality in reservoirs and lakes.

Improve information on effectiveness of road stabilization measures.

Improve understanding of effectiveness of protection of Class IV and headwall areas.

Improve understanding of influence of rain-on snow events on mass movements.

Environmental Consequences Of The Alternatives On Air

Clean air is a renewable resource, and the management of the airshed is a responsibility of all Federal natural resource managers. The Clean Air Act, as amended in 1977, directs Federal agencies to comply with State and local regulations directed at preventing and controlling air pollution.

Visibility is the air quality parameter most sensitive to management activities on the Forest. Studies are currently being conducted regarding visibility impairment and air quality impacts, Region-wide. Data from one study indicates that the suspended particulates in smoke from forest slash burning and agricultural field burning cause the greatest impacts during visibility impairment periods (DEQ 1985).

While smoke and haze detract from a Forest user's visual and recreational experience as it pertains to vistas, panoramic views and the expectation of fresh air, no emissions from forestry burning have yet been identified by the Environmental Protection Agency (EPA) as hazardous to human health, and no threshold limit has been set for compounds in Forest smoke (Sandburg et al. 1979). However, in residential areas smoke from wood stoves is becoming a health concern as more people are using wood for home heating. This smoke combines with other urban pollution sources and contributes to periods of air quality degradation in the Willamette Valley. Forest smoke can have a cumulative impact on air quality in urban areas when it occurs in conjunction with periods of cold weather that result in high use levels of firewood. In addition, firewood use is an air quality concern for the Forest because the Forest is one of the major sources of firewood for adjacent communities.

Although the "scrubbing effect" of the westerly winds improves air quality in the Willamette Valley and along the western edge of the Forest, smoke and haze is then directed toward other sensitive areas. Mt. Jefferson, Three Sisters, Diamond Peak, and Mt. Washington Wildernesses are mandatory Class I Federal areas protected from air quality degradation by law. Other sensitive areas adjacent to the Forest include Salem, Springfield, Eugene and other cities in the Willamette Valley. Communities within the Forest and east of the Cascade Crest, such as Bend, where recreation and tourism are important, have also expressed increasing concern about air quality. (See Chapter III, Air, for an airshed map.)

Direct and Indirect Effects of the Alternatives on Air

Pollution sources that affect the airshed of the Forest come from a number of causes. Forest management activities that affect the airshed include slash burning, dust and vehicular emissions from travel on Forest roads, and the use of chemicals for the control of insects, diseases and vegetation. Off forest emissions sources include pollutants from vehicles and factories; smoke from slash burning by private landowners and other land management agencies; smoke from agricultural burning; herbicide and pesticide use; and airborne dust from unvegetated areas and farm lands.

Wildfires also have a high potential to impact air quality. Unlike prescribed fire, frequency of wildfire, the amount of emissions, direction and dispersal of smoke, and duration of smoke inundation cannot be predicted or controlled. Increased use of the Forest for recreation and project activities increases the potential for human caused wildfires, thus the frequency of adverse effects to air quality from wildfire could increase.

The increased use of wood for home heating and industrial hog fuel also contributes to air pollution. During the winter months and periods of air inversions this is becoming increasingly evident in communities within and adjacent to the Forest.

Forest management activities such as road construction, road maintenance, and commercial traffic on the roads results in localized reduction in air quality due to increased particulates in the air, primarily in the form of dust.

Prescribed burning and Potential for Wildfire - Of the Forest management activities, prescribed burning has the greatest impact on the air quality. Historically, air quality impacts have been directly proportional to the amount of timber harvest. As timber harvest activities increased, so did burning. Primary consideration was the elimination of fuels on the units and reduction of residual vegetation which competes with conifer seedlings. Alternative NC has the highest harvest rate, and air quality is a greater concern, with harvest and air quality problems decreasing in K, A, J, W (PA), D and L, respectively.

The effects on air quality from wood smoke are measured in particulate matter less than 10 microns (PM-10). Emission rates for the Forest are based on projections of the amount of final harvest acres to be treated by prescribed burning, research on slash consumption and the amount of PM-10 in the resulting smoke. PM-10 emissions vary with the wood source being burned. Douglas fir generates 23.12 pounds of PM-10/tom of wood consumed. Mixed conifer has 20.53 lb. PM-10/ton of wood burned. Depending on both site specific conditions and efforts to reduce smoke emissions, not all final harvest acres will necessarily be treated by prescribed burning.

Alternatives NC, K, and A would produce the highest levels of PM-10 emissions annually as a result of high harvest levels and emphasis on maximum harvest of old-growth and mature Douglas fir which would require high treatment levels. Annual emission levels are lowest in Alternatives D, W (PA), and L. Emissions would be reduced in Alternative W (PA), even on lands intensively managed for timber production because of increased concern for ecosystem function and vegetation diversity.

Based on timber harvest levels, Figure IV-5-1 displays the average number of acres that could be treated annually by prescribed burning. Depending on site specific fuel loadings, efforts to reduce smoke emissions, and resource objectives all of acres may not be treated.

Implementation of Alternatives NC, A, J, and W (PA) would result in a higher potential for wildfire occurrence. Activities associated with these alternatives would cause approximately 22 to 53 general Forest and recreation use fires and 8 to 10 fires related to timber harvest or industrial operations. In addition, 10 to 14 wildfires resulting from escaped prescribed burns would be expected to occur annually. These fires would result in an estimated annual burned acreage from 437 to 609 acres.

Firewood Availability and Use - Management of forest residue by the Forest to provide firewood for public consumption indirectly results in reduction in air quality in local communities and major urban areas. Reducing the amount of firewood coming from Forest land, may not improve overall air quality due to increased use of alternative fuel sources, increased efficiency of wood stoves, and availability of firewood from lands in other ownerships.

Availability of firewood is directly related to the timber harvest levels on the Forest. Alternative NC will have the greatest availability of firewood, with Alternative L having the least. Demand for firewood is not expected to exceed availability through on and off Forest sources under any of the alternatives, but access to the available gathering areas may not be as convenient in the alternative with the lower harvest levels.

Smoke from wood stoves creates air quality impacts in the more populated areas off Forest. Wood stove emissions are becoming an increasing health concern and, as of July 1, 1986, state law requires stringent emission controls on all wood burning stoves sold within the state of Oregon. It is estimated

that the use of firewood for home heating produces about 72 pounds of PM-10 emissions per cord burned (Lane Regional Air Pollution Authority 1986). While it is difficult to predict both local demand for and consumption of firewood, every 10,000 cords of firewood supplied to the public would generate approximately 360 tons of PM-10 emissions when burned.

Commercial use of wood products to fuel industrial plants results in increased utilization of forest residues. The direct effect of the Forest's emphasis on increasing utilization would indirectly affect air quality in industrialized areas off the Forest. Wood chips used as hog fuel would be expected to produce similar amounts of PM-10 emissions per unit of measure as firewood, though industrial emission control devices will filter out much of this matter.

Cumulative Effects on Air

The Council on Environmental Quality (CEQ) regulations require that all Federal agencies consider cumulative impacts in environmental analysis. Analysis includes impacts associated with actions "regardless of what agency (Federal or non-Federal) or person undertakes such actions" (40 CFR 1508.7). To assess the influence of cumulative effects it is necessary to model the "cause-effect" relationship between emissions and atmospheric response. This is accomplished by monitoring burning activity, transport winds, and the resultant impacts. While several methods of modeling and monitoring impacts on the airshed exist, few, if any, have provided quantitative evaluation of the actual impacts on the environment.

In all proposed alternatives, harvest levels and public concern indicate that future use of prescribed burning on the Forest would be lower than current levels.

Wildfires are not generally thought to be a major contributing source of cumulative effects associated with particulate emissions. Although site specific cause and effect relationships have not been well defined in the past, visibility and atmospheric conditions are currently being monitored by the State of Oregon Department of Environmental Quality (DEQ). This study may establish baseline data useful for future evaluation of environmental impacts.

A decrease in available firewood from the Forest is not expected to result in a major decrease in firewood use, as demand would shift to alternative sources. Although the demand for firewood may remain high, the availability of firewood from both private and Federal lands could decrease in the future. It is doubtful that the timber harvest levels predicted in the alternatives would cause the demand for firewood to exceed the potential supply. Increasing availability of firewood by reducing slash burning could compensate for losses associated with decreased timber harvest in some areas. Even with the implementation of Oregon's 1986 woodstove law, it is expected that woodstoves will still produce more air pollution than other home heating sources, although the use of more efficient clean-burning woodstoves and the burning of dry, cured firewood are expected to significantly reduce particulate emissions and subsequent impacts on air quality (Lane Regional Air Pollution Authority 1986).

Monitoring of past activity by the U.S. Forest Service, the National Park Service, the State of Oregon Department of Environmental Quality (DEQ) and local citizens groups has shown that elevation, timing and spacing of prescribed burns both on and off forest are all important factors in the management and dispersion of smoke through the airshed. Many uniform haze episodes have been a result of the cumulative effect of dispersed field and forest slash burning activity. Due to weather restrictions and other constraints, potential prescribed burning periods are extremely seasonal and concentrated, with various State, Federal and private agencies utilizing the same periods for prescribed burning. This temporarily results in a cumulative concentration of air quality problems.

The cumulative effects of Forest management activities on air quality are poorly understood. To date, no specific adverse effects of particulate emissions caused by Forest management activities have been identified by the Environmental Protection Agency (EPA) as a human health hazard.

There is growing global concern for the increasing effects of carbon dioxide and carbon monoxide emissions on the quality of the human environment. Past, present, and future burning of forest residues by industry or managers of private, State, and Federal forest lands may cause significant adverse cumulative effects to climate, including global warming. These effects cannot be addressed at a Forest level. Only the contribution of Forest management activities to the problem can be disclosed. Refer to the discussion on Climate for further information.

Mitigation Measures for Air

All of the proposed alternatives would implement the best available technology for prescribed burning to meet the following objectives:

- Manage the smoke in accordance with the Oregon Smoke Management Plan;
- Implement burning plans that are site specific to fuel conditions and are designed to achieve acceptable emission rates;
- Schedule burns to disperse smoke and minimize the impacts to the airshed.
- Utilize a number of operational measures,as specified in the standards and guidelines to minimize the potential impacts of smoke in the Forest airshed.

To manage smoke concentrations and prevent smoke intrusions into Designated and Manditory Class I areas, the Forest complies with smoke management instructions that are issued daily by the State Forester's Office in Salem. These instructions specify where and when burning is allowed and coordinate all prescribed burning activities on Federal, State and private land in western Oregon.

A reduction in the total emissions produced by the Forest will be achieved by a combination of methods including:

- Increasing the utilization of forest residues including firewood, posts, poles, chips, and hog fuel for industrial plants;
- Burning when fuel moistures are higher to reduce the amount of material consumed;
- Leaving increased amounts of standing dead and defective trees and large woody debris;
- Reducing prescribed burning as a post harvest treatment of forest residues.

When burning is prescribed to meet resource objectives, burn plans will specify optimum burning conditions. Early, aggressive, mop-up will also be used to reduce particulate emissions from the smoldering phase of a burn.

Additional fire precaution measures for industrial operations, which limit operations during periods of higher fire danger and requiring firefighting equipment at operations with the potential for fire starts, will continue as a part of the overall fire prevention program. Contract provisions specify preventative

measures and the availability of additional personnel and equipment required for the prevention, early detection, and suppression of fires within the project area.

Intensified fire prevention patrols and contacts will be used to increase public awareness.

Relationships With Other Agency Plans or Policies for Air

All prescribed burning operations in western Oregon, and on the Forest will continue to be conducted in accordance with the Oregon State Smoke Management Plan (Oregon State Forestry Directive 1-1-3-410), under the direction of the State Forester's Office in Salem. On days when only limited burning is allowed, an area of potential conflict exists between the Forest, adjoining National Forests, State and other Federal land management agencies. The conflict centers around burning priorities, and who is allowed to burn. While the State Forester's Office coordinates all burning activities in the State of Oregon, resolution of scheduling conflicts is made between the local agencies involved.

Incomplete or Unavailable Information

The long term effects of emissions generated by burning wood products on global warming.

Health hazards associated with forest workers subject to high doses of suspended particulates while working on wildfires or prescribed fires.

Environmental Consequences Of The Alternatives On Climate

The climate of the Willamette Valley and western Cascade Mountains is referred to as Pacific Maritime, and has a strong influence on the vegetative patterns of the Forest. The relatively dry, cool summers and mild wet winters are particularly favorable to forests of evergreen conifers (Waring and Franklin, 1979).

Site specific microclimate conditions also play an important role in determining vegetation types, and are directly affected by land management activities.

On a global scale, forests account for about 75-80% of the carbon stored in plant biomass on the land surface, (Ajtay, et al. 1979) and play an important role in regulating the levels of carbon dioxide in the atmosphere. Whether or not global warming is occuring, and what effect it will have if it does, is cause for ongoing debate and controversy. The Forest/Atmosphere Interaction Priority Research Program (FAI-PRP) was initiated by the USDA Forest Service in FY 1990 to build upon existing research efforts and to use a complete ecosystem perspective when examining the interactions between forests and the atmosphere (USDA Forest Service, 1990)

Direct and Indirect Effects of the Alternatives on Climate

Microclimate - Timber harvest, particularly under even-aged systems, creates openings in the forest canopy that result in lower humidity, increased solar radiation, and changes in wind patterns. On a small scale, these openings become areas of climatic extremes, unbuffered by the canopy. Indirect effects of climatic extremes may lead to temporary loss or dislocation of plants or animals from the affected area.

Global Climate - Deforestation has been a source of increasing carbon dioxide in the atmosphere in the last century (Harmon, et. al., 1990). Alternatives that harvest the most timber, generally construct the most miles of road, decreasing the amount of forested land. The decrease in the first decade ranges from about 400 acres in Alternative NC to 40 acres in L. Alternatives K, A, J, W, and D will result in decreases of 275, 250, 225, 200, and 150 acres of forested land respectively. The existing road system accounts for about 24,750 acres. Most of the remaining road system will be constructed in the first decade for each of the alternatives.

The harvest of old growth releases carbon stored in plant materials and the forest floor into the atmosphere as carbon dioxide. Fast growing, intensively managed stands absorb carbon dioxide rapidly but generally lack long-term storage in dead materials and deep forest floors. Converting from an old-growth stand to a stand managed on short rotations would result in a net loss of about 150 tons/acre of stored carbon (Ibid.).

Cumulative Effects of the Alternatives on Climate

Microclimate - Alternatives that harvest more acres will maintain a proportionally larger percent of the Forest acreage in created openings at any point in time. The increased solar radiation and lower humidity will increase the risk of fire as vegetation and fuels become drier. Increased wind movement near the ground may cause higher transpiration rates, reducing soil moisture.

Global Climate - Conversion of old-growth stands to intensively managed second growth results in a net loss of stored carbon, even when considering multiple rotations (Ibid.). The magnitude of loss is estimated to be about 150 tons per acre of old growth harvested. Data is not available on the amount

of old growth harvested in Alternative NC. Alternatives K and A would result in reductions of stored carbon by 8.2 and 8.1 million tons respectively, in the first decade. Alternatives J, W, and D will reduce stored carbon by 6.1, 6.6, and 6.3 million tons, with Alternative L having the least reduction at 0.5 million tons.

The total amount of carbon stored in old growth on the Forest is about 164 million tons. The first decade harvest represents a decline in stored carbon of about 5% for alternatives K and A, down to about 0.3% for Alternative L. Alternatives J, W, and D show a decline of about 3.7, 4.0, and 3.9% respectively in the amount of stored carbon. In the western Cascades of Oregon and Washington there are an estimated 4.9 million acres of old growth, with about 1.35 billion tons of stored carbon (Ibid.). The old growth harvest in alternatives K and A represent a stored carbon decline of about 0.6%. Alternatives J, W, and D represent a decline of about 0.5%, and Alternative L a decline of 0.04%.

The effects of the alternatives are not significant when compared against regional or global levels of carbon storage or acres of deforestation. However, long-term monitoring and research is needed to evaluate the effects of management activities on climate, particularly in light of the increasing concerns about global warming.

Mitigation Measures for Climate

Microclimate - Harvest systems that maintain a portion of the overstory can be used to avoid creating a harsh environment that may not be able to be regenerated within 5 years. Artificial shading, shelterwood harvest, or uneven-aged management can be used in place of clearcutting. Careful sale design and layout can also avoid potential microclimate problems.

Global Climate - On a global scale, mitigation includes increasing the amount of forested land, and reducing fossil fuel use. At the Forest level, mitigation will result from the application of some of the "New Forestry" practices. Harvest units with overstory trees left to provide attributes of old-growth habitat at an earlier age, and leaving large woody debris on the ground, will keep a greater amount of carbon in storage. Managing for a diversity of plant and animal species will allow ecosystems and plant distributions to shift as climate changes. High levels of genetic diversity will also allow species to adapt to climatic changes through natural selection.

Incomplete or Unavailable Information

As a result of increasing concerns over global warming, there is an international effort underway to determine the causes and impacts. Specific research designs and long-term monitoring are needed to detect and evaluate the effects of a changing chemical and physical environment.

Environmental Consequences Of The Alternatives On Vegetation

Vegetation on the Forest is dominated by dense stands of Douglas fir and other conifer species covering about 90% of the Forest land base. Woody shrubs and lush herbaceous plants are found in the understory of these timber stands. Interspersed within the major Forest plant communities are meadows, rock cliffs, and extensive alpine and subalpine parklands. Hardwoods such as alder, big-leaf maple, and willow generally dominate riparian areas adjacent to rivers and lakes, and wetland areas contain grasses, forbs, and sedges.

There are 21 sensitive plant species on the Forest; no plants are currently listed as threatened or endangered. These species are usually associated with plant habitats that include bogs and wet areas; rocky ridge tops and slopes; and open slopes, fields, or meadows above timberline. Any proposed activity that affects the population or distribution of sensitive plant species will be evaluated on a case by case basis to determine the extent of potential impact and level of necessary mitigation.

Plant communities and vegetative conditions change naturally. Silvicultural activities such as harvest, reforestation, release, thinning, fertilization and salvage will also affect vegetative conditions, usually at a faster pace than natural changes.

Successional stages, plant diversity, old-growth forests, timber, riparian zones and range are discussed in this section. The consequences of the alternatives on wildlife habitat, scenery, H.J. Andrews Experimental Forest, and Research Natural Areas (RNAs) are described in detail in their respective Chapter IV sections.

Direct and Indirect Effects of the Alternatives on Vegetation

Because of the Standards and Guidelines (S&Gs) that govern all Forest management activities there is little difference in the types of direct effects on vegetation among the proposed alternatives. Differences among the alternatives are generally the result of the amount, scheduling, and location of the proposed activities that remove or alter vegetation. The differences range from Alternative NC, which includes short-rotation timber management activities on about two-thirds of the Forest, to Alternative L, with a mix of long and short rotations on only one-third of the Forest.

Successional Stages

Disturbance to vegetation, whether natural or human caused, affects species composition, size, age, density, and the overall pattern of vegetative cover. Natural successional patterns are maintained in a number of areas on the Forest, which promotes vegetative diversity. Natural plant succession is most apparent in designated Wilderness, and vegetative conditions remain generally undisturbed in old-growth groves, subalpine and alpine plant communities, nonforest lands such as meadows, wetlands, and rocky cliffs, and in areas managed for semiprimitive recreation with timber harvest constraints. On these lands, disturbance to vegetation is usually the result of events such as fire, floods, or windstorms, or impacts from wildlife or recreation use. Vegetation may be altered in developed recreation sites for the safety and convenience of Forest users.

Changes in vegetation are most apparent in areas of the Forest managed intensively for timber production. During timber harvest and reforestation activities, the successional stage of a stand of trees is abruptly changed from large trees, to brush, grasses, and seedlings. (See Chapter III, Vegetation, Figure "Successional Pattern of Stand Conditions.") Trees are removed, and falling and yarding operations uproot and crush many of the understory shrubs and forbs. Harvest units may be burned to reduce

logging slash and prepare sites for reforestation. While some understory vegetation is destroyed, other plants respond to these disturbances with vigorous new growth. As a result of both increased sunlight and reforestation efforts, species composition generally changes from shade tolerant to shade intolerant species.

The survival, growth, and vigor of desirable tree seedlings are enhanced by timber stand improvement activities. These activities include reducing brush competition, precommercial thinning, and fertilization. The scheduling of silvicultural treatments manipulates species composition, density, successional stage, and age of the stand. Methods include mechanical, manual, and biological techniques, and the use of prescribed fire and chemicals. See Appendix F for a full discussion of silvicultural practices and techniques.

The harvest level associated with each alternative will determine the amount of the Forest which will undergo abrupt changes in successional stage each decade. This will determine, not only the ultimate condition of the Forest, but the rate at which the Forest moves toward that condition. Alternative L will result in a forest that is generally older, with a greater representation and wider distribution of the later successional stages of large, older trees and accompanying understory vegetation. Alternatives J, W (PA) and D are similar to each other, but will have fewer acres in later successional stages than Alternative L. Alternatives NC, K, and A have the fastest harvest rates, and will result in a forest that is younger, overall, with less representation of the later successional stages, than the other alternatives. The faster rates of harvest will result in more fragmented distribution and declining effectiveness of habitat in the older stages.

Plant Diversity

Diversity can be discussed in terms of richness (i.e., the variety of species) and evenness (i.e., the relative population levels of each species). In forested plant communities, the early successional stages (grass/forbs) and old growth stages have the greatest diversity of plant species. (See Figure IV-3) Special and unique habitats associated with cliffs, talus, meadows, marshes, bogs, and riparian areas contribute significantly to the overall plant diversity of the Forest.

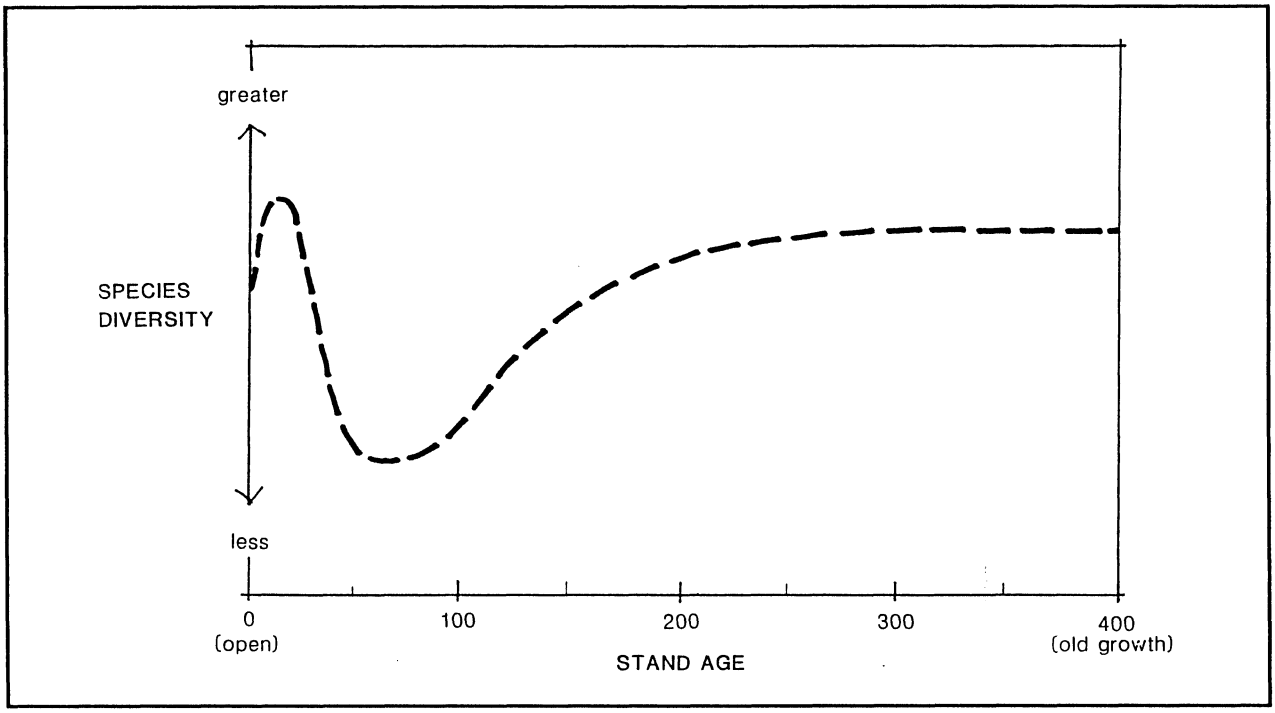
Most management activities directly affect vegetation resulting in changes to seral stage, species composition, and plant diversity. While timber harvest activities, which influence the greatest amount of area, may not affect overall species richness, they do significantly change species evenness. Alternatives NC, A, and K provide little or no protection of special and unique habitats other than T&E plants. This would cause significant disturbance and result in a high risk of losing many plant species. In addition, these alternatives propose to harvest most old growth stands, converting them to intensively managed forests which may not maintain well distributed populations of plant species endemic to the Forest. Alternatives J, W (PA), D, and L, respectively provide increasing protection for special and unique habitats and maintain old growth stands distributed throughout the Forest. Alternative L maintains most of the Forest vegetation in an unmanaged condition.

Silvicultural and vegetation management practices directly affect vegetation diversity by favoring commercial tree species like Douglas fir over hardwood trees and minor conifer species. Vegetation management activities involving the use of herbicides significantly reduce the diversity of broad-leaved forbs, shrubs, and trees in early seral forests. Prescribed fire directly affects plant diversity by consuming existing vegetation and could eliminate fire-sensitive species. Aggressive non-native plants commonly invade burned areas.

Recreation use can adversely impact plant species growing in sensitive environments. Areas receiving heavy use by hikers and campers could be damaged resulting in a loss of plant diversity from trampling, soil compaction, or development of campsites.

Habitat enhancement activities involving the establishment of preferred forage plants could directly affect the establishment and seral development of native plants.

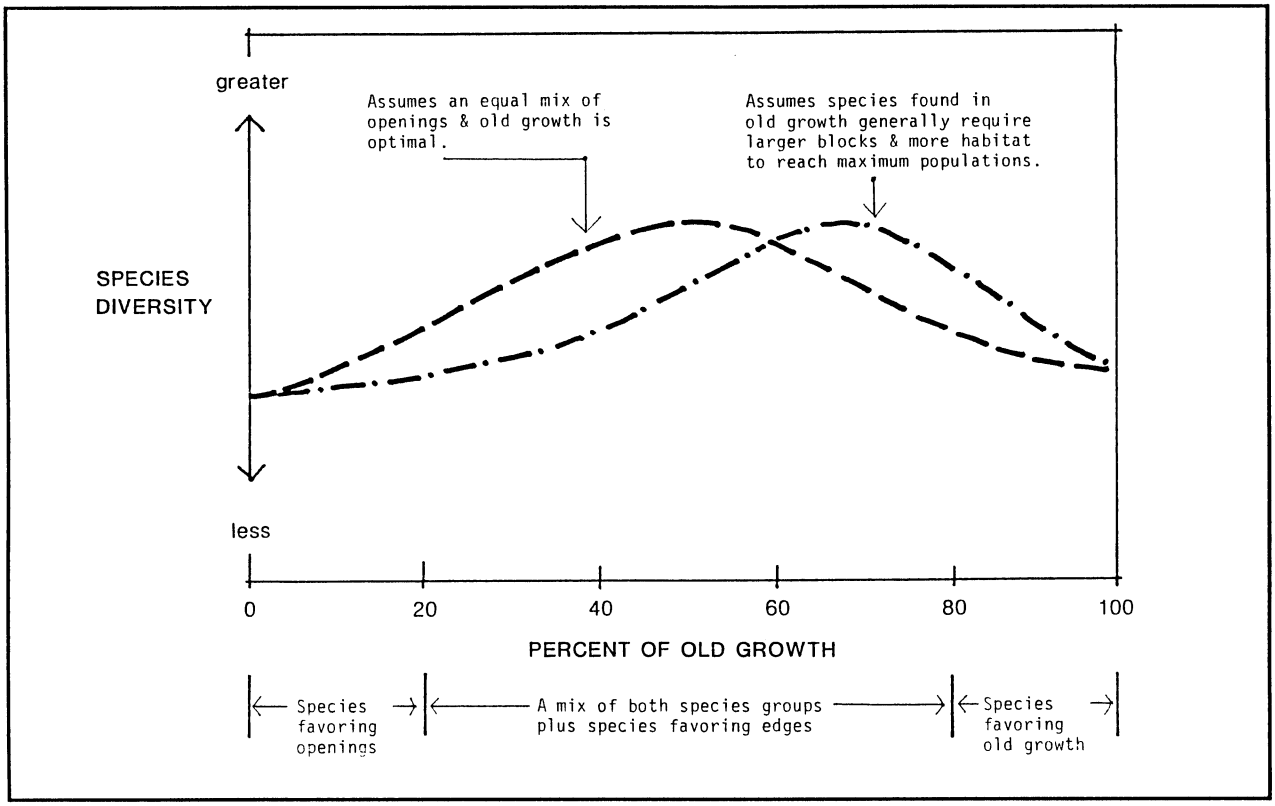
Figure IV-3. Diversity by Stand Age



From a Forest-wide standpoint, the greatest diversity would occur with a mix of old growth and forest openings. This would provide habitat for species adapted to old growth as well as those adapted to openings, second growth, and edge habitat. Figure IV-4 shows two assumptions regarding the optimal mix of old growth and openings. One line shows the relationship of species diversity and the amount of old growth with the assumption that the greatest diversity occurs when their is an equal mix of old growth and openings. The other line assumes that species adapted to old-growth conditions require larger blocks and more habitat to reach maximum populations and that the ideal amount of old growth would be more than 50%. In either case, substantially reducing the amount of old growth could reduce overall species diversity, particularly evenness.

The current condition of the Forest has about 40% of the forested lands in the old growth successional stage. At the end of the first decade, there is little difference between the alternatives (NC at 33% to L at 38%) as to the amount of forested lands remaining in old growth. After five decades the differences are more apparent. Alternative L provides the best balance between successional stages, maintaining about 35% of the forested lands in old growth. Alternatives D and W (PA) maintain 24%, and Alternatives J, A, and K are at 23, 22, and 20% respectively. Alternative NC will provide the least balance between successional stages, maintaining about 17% of the forested lands in old growth.

Figure IV-4. Forest-wide Diversity



Old-Growth Forests

One stage of natural vegetative succession that is not duplicated in stands managed intensively for timber production is old growth. Old growth is characterized by multi-layered canopies, large old trees, standing snags, and large logs in streams and on the Forest floor. The values associated with old-growth timber relate to its importance for wildlife habitat, scenic qualities, clean water, awe-inspiring recreational and spiritual qualities, maintaining diversity of the gene pool for future stands, supplying timber of exceptional quality and value, and providing a living connection with the past.

There are currently about 594,800 acres of old-growth trees on the Forest that meet the Pacific Northwest Region definition of old growth (see Regional Guide). Of the total old-growth forest, 78% is low elevation Douglas fir/hemlock. The higher elevation types are found in the following proportions: Douglas fir/true fir and true fir combined is 16%; and mountain hemlock/lodgepole pine is 6%.

The major effect on old growth will be through the sale and harvest of timber, which causes a sudden change from old growth to the grass/forb successional stage. Most of the area harvested will be managed with a rotation length shorter than the time necessary to reach a similar old-growth stage. The size, shape, and arrangement of old-growth stands affect their integrity as habitat for plants and animals. Harvest activities will reduce the size, increase the amount of edge, and fragment the old-growth stands allocated to timber yield. Effective old-growth habitat in these areas will be substantially less than the actual acres of old growth (Hemstrom 1986). Figure IV-5 shows the relationship of effective old-growth habitat and stand size. As the size of old-growth stands are reduced through timber harvest,

the effectiveness of the habitat begins to decline at a much faster rate than the decline of actual old-growth acres.

Figure IV-5. Effective Old-Growth Habitat

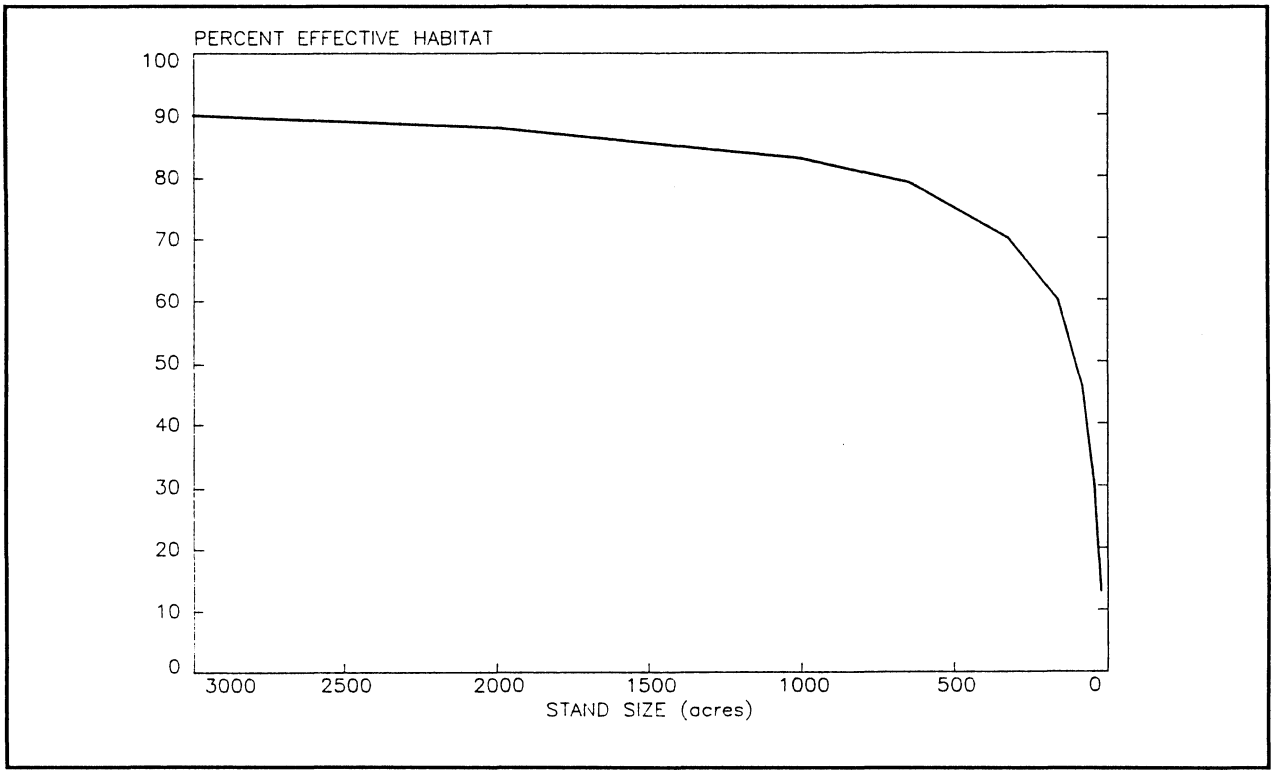


Figure IV-6 shows the distribution of old growth on the Forest at the present time, by no-harvest allocations and land unsuited for timber production. Also shown are the acres of old growth available for some level of timber harvest.

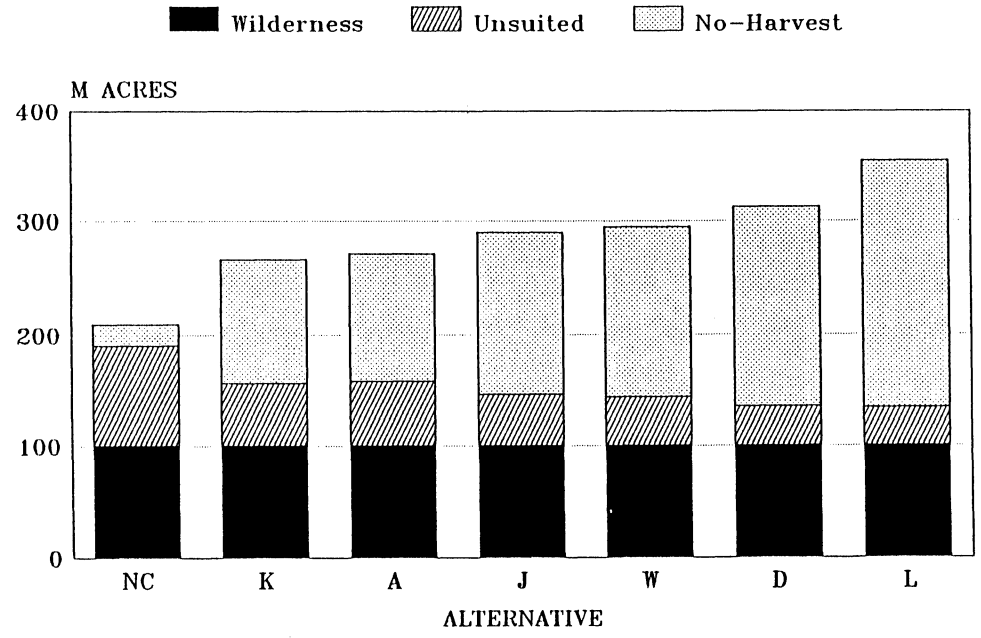
Alternative L, which sets aside 419,500 acres of old growth, retains 71% of the current total. Alternatives D, W (PA), and J retain 53, 50, and 49% respectively, followed by A and K at 46 and 45%. Alternative NC has the least amount set aside, with 35% of the current 594,800 acres of old growth.

Table IV-8 shows the acres of old growth at the end of decades 1, 2, and 5. Also shown is the total of forested acres that will not be harvested for each alternative. In the absence of natural disturbances, these figures represent the potential amount of old growth as the smaller size classes gradually move through the successional stages over time.

Alternative L maintains the greatest amount of old growth at the end of five decades (523,100 acres). With fewer acres harvested per year, there will also be a slower decline in the effectiveness of the old-growth habitat. Alternatives D and W (PA) maintain about 30% fewer acres. However, Alternative D will result in greater fragmentation and fewer acres of effective old-growth habitat than W (PA), because it harvests old growth at the same rate as W (PA), but on a smaller land base. Alternatives J, A, K, and NC drop to 35, 36, 42 and 50% less than the acres in L. From Alternative L to NC, (with

the exception of Alternative W (PA)) there is a corresponding increase in the annual harvest of old growth and a proportional increase in the rate of decline in effective old-growth habitat. The gap between acres of old growth and acres of effective old-growth habitat widens from Alternative L through Alternative NC.

Figure IV-6. Old growth by Allocation



		Alternatives						
Allocation	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Wilderness	M Acres	100.8	100.8	100.8	100.8	100.8	100.8	165.4
Unsuited	M Acres	89.9	56.5	58.2	45.9	43.5	35.1	33.8
No-Harvest[1]	M Acres	19.3	109.2	112.4	143.6	150.6	177.1	220.3
TOTAL [2]	M Acres	210.0	266.5	271.4	290.3	294.9	313.0	419.5
Timber Harvest	M Acres	384.8	328.3	323.4	304.5	299.9	281.8	175.3
Current TOTAL	M Acres	594.8	594.8	594.8	594.8	594.8	594.8	594.8

[1]No-harvest allocations can include semiprimitive nonmotorized, riparian, special wildlife habitat, Special Interest Areas, and MRs.

[2]This figure displays the minimum amount of old growth that could be maintained over the planning horizon (150 years) by alternative. None of the alternatives actually reach this minimum level due to in-growth.

Table IV-9 Old-Growth Acres Over Time

	Alternatives [1]						
	NC [2]	K	A	J	W	D	L
Decade 1 (M Ac.)	494.0	522.4	528.4	534.9	533.4	537.2	578.3
Decade 2 (M Ac.)	NA	449.7	460.9	473.6	479.1	478.4	558.1
Decade 5 (M Ac.)	259.8	305.1	337.0	341.4	365.2	367.8	523.1
Decade 15+ (M Ac)	440.1	571.7	630.2	651.1	729.9	785.1	951.4

[1]Acres of old-growth timber, in all allocations, remaining at the end of each decade. Decade 15+ values show potential old growth on forested no-harvest allocations, assuming no catastrophic events.

[2]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other alternatives, and could not be modeled with the current Forest FORPLAN model. Appendix B of the FEIS describes these differences.

Timber

With the reduction of uncontrolled wildfire, timber management activities have become the major cause of ecosystem disturbance on the Forest. Silvicultural activities are aimed at establishing and tending timber stands and at harvesting wood products from the Forest. These include site preparation, reforestation, timber stand improvement, commercial thinning, and final harvest. Most silvicultural practices on the Forest are implemented with the intent to perpetuate the growth and development of even-aged stands of timber.

A specific amount of timber harvest is proposed in all alternatives. The magnitude of the effects of the alternatives on the timber resource depend on three basic factors. The most important of these is the number of acres suited for timber production. The other factors are the intensity of management and rate of harvest. These factors determine the amount of volume to be offered for sale during the plan and the level of harvest that can be sustained in the long-term.

Effects on Suited Acres - Figure IV-10 shows the comparison of lands suited for timber production by alternative and percent of full yield. For all alternatives except NC, there are 1,032,138 acres on the Forest that are tentatively suitable for timber management. (See Chapter III, Timber.) Removal of 85,513 acres for management requirements (MRs) leaves a potential land base for timber management of about 946,625 acres. Alternative NC with different suitability standards and no consideration of MRs, exceeds this potential by 12% (1,064,616 acres). Alternatives K, A, and J schedule harvest on 99, 92 and 90% of this potential respectively. Alternatives W (PA) and D are in the medium range with 82 and 76%, and Alternative L schedules harvest on 58% of the potential land base for timber management.

Table IV-10. Comparison of Suited Timberlands

					Timber Yield Acres with Yield Reductions to Meet Other Resource Objectives					
Alternative	**Acres with Timber Yield**	**% of Tent. Suited -MRs[1]**	**No Yield**	**% of Tent. Suited - MRs**	**Acres of Full Yield [2]**	**%**	**75-94% Full Yield**	**%**	**50%-74% Full Yield**	**%**
NC (No Change) [3]	1,064,616	112%	0	0	918,657	86%	54,000	5%	91,959	9%
K	932,813	99%	13,992	1%	796,974	85%	70,306	8%	65,533	7%
A	874,291	92%	72,514	8%	743,451	85%	71,236	8%	59,604	7%
J	853,398	90%	93,407	10%	719,610	84%	72,556	9%	61,232	7%
W	774,608	82%	172,197	18%	689,229	89%	42,870	6%	42,509	5%
D	719,439	76%	227,366	24%	638,929	89%	40,425	6%	40,085	5%
L	553,090	58%	393,715	42%	314,299	57%	74,857	14%	163,938[4]	29%
Rotation Age					60-110 years		140 years		200 years	

[1] Suited acres minus MRs = Total Forest acres (1,675,407) - nonforest acres (146,153) - withdrawn acres (327,501) - roads and unsuited acres (169,615) = 1,032,138 acres tentatively suited - acres required for resource management objectives (36 CFR 219.14 (c)) which preclude timber production (85,513) = 946,625 acres.

[2] Full yield is that developed in a yield simulator, less operational falldown, without further reductions for other resource considerations, and available for harvest at CMAI (or 95% CMAI).

[3] Alternative NC has the same land allocations as Alternative A (No Action) but is based on different land suitability standards and does not include MRs. It also assumes the necessary budget, workforce and technology will be available to produce full timber yields from 125,000 acres of "marginal" land.

[4] This table includes 74,941 acres that are managed on rotations of 330 to 660 years, with timber outputs that are less than 50% of full yield.

The timber volumes produced are a direct result of, and follow the same trend as, the number of acres managed. Table IV-11 shows volume by harvest method for the alternatives. The alternatives that produce the most timber volume are NC, K, and A which harvest 146, 117, and 110 MMCF per year in the first decade, respectively. Alternatives J, W (PA), and D provide moderate levels of timber at 95, 87, and 86 MMCF per year, with Alternative L producing the least amount of timber at 27 MMCF per year in the first decade.

Historically, firewood has come from a portion of the cull material associated with timber harvest and is part of the timber sale program quantity (TSPQ). The amount available for firewood use varies depending on the market for chips and cull peelers, and contract specifications for size of cull material to be removed from the harvest unit.

Because of their proposed high levels of timber harvest, Alternatives NC, K, and A would provide the most firewood, with 72, 57, and 54 thousand cords per year in the first decade. Alternatives J, W (PA) and D would provide moderate levels of firewood at 46 to 42 thousand cords and Alternative L would provide the least firewood at about 14 thousand cords per year in the first decade. Availability of firewood in all alternatives decreases over time as the harvest of older existing stands is replaced, to a great extent, by the harvest of managed stands and commercial thinning. By the fifth decade, firewood supplies are expected to decline to about 50% of the first decade levels.

Commercial thinning volume is nearly equal in the first decade for all alternatives except L, because the size classes available for thinning are mostly on lands that are suited for harvest under all alternatives (Table IV-11). By the fifth decade the commercial thinning volume shows more variation, reflecting the differences in harvest levels and management intensities. Exact figures for Alternative NC are not available, but commercial thinning in the fifth decade will account for about 50% of the total volume.

The long-term sustained yield capacity (LTSYC) for each alternative is a prediction of the maximum timber volume that can be sustained annually from the tentatively suitable timber lands on the Forest consistent with the multiple use objectives of the alternative. The difference in long-term sustained yield capacities between alternatives reflects the number of acres suitable for timber management, and the intensity of timber management and rate of harvest assigned to those acres.

The long-term sustained yield capacities of the alternatives are influenced most by the number of acres suited for timber management. Alternative NC has the highest capacity at 146 MMCF because it has the most acres suited for timber management. The LTSYC of the other alternatives decrease as the amount of land considered unsuited, or allocated to non-timber or more restrictive timber uses increases. (See Tables IV-10 and IV-11.)

For all alternatives, except NC, LTSYC is greater than beginning harvest levels (See Table IV-10). This occurs because the managed stands of the future will produce or grow more volume than the existing stands of mature timber are currently growing. In the sixth to eighth decades there will be a shortage of mature timber available for harvest because the bulk of the second growth will not have reached 95% of culmination of mean annual increment (CMAI). Application of the nondeclining yield constraint means that harvests in the earlier decades must be held below LTSYC to avoid a drop in volume in decades six to eight. Alternative NC avoids this situation by relying heavily on commercial thinning volume to offset the shortage of mature timber available for harvest in the sixth to eighth decades. As many as six thinnings, spaced ten years apart are prescribed for some stands, with the total yield from commercial thinning accounting for half or more of the volume in some decades.

Effects on Intensity of Management - Intensity of management refers to the mix of silvicultural treatments applied to the acres which are suited for timber management. The silvicultural treatments

used in the alternatives include reforestation, release, precommercial thinning, fertilization, commercial thinning, and regeneration harvest. The difference between alternatives is the number of acres to which these treatments are applied. These are displayed in Figure IV-4-8. The individual treatments and their effects are described in Chapter III, Timber.

Alternative NC, K, and A harvest the most area with an average of 14,400, 12,600 and 12,100 acres per year in the first decade. Alternatives J, W (PA), and D are in the moderate range with 10,200 to 9,100 acres. Alternative L harvests the fewest number of acres at 3,300.

The other silvicultural treatments are a function of the acres harvested, accessibility, and response to fertilizer (except Alternative NC which did not include the use of fertilizer).

Historically, treatments to release seedlings from competing vegetation have been necessary on about 20% of the acres reforested. The Forest Plan incorporates the Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation. In implementing the Forest Plan through project activities, the Forest will comply with the Record of Decision issued by the Regional Forester dated December 8, 1988, and the Mediated Agreement of May, 1989. Use of all vegetation management techniques is allowed only when other methods are ineffective or will unreasonably increase project costs. Emphasis must be on prevention and early treatment of unwanted vegetation and full public involvement in all aspects of project planning and implementation.

Table IV-11 Annual Volume of Commercial Thinning and Final Harvest

		Alternatives						
	Net Volume	NC	K	A	J	W	D	L
1st Decade								
Total	MMCF	146	117	110	95	87	86	27
Final Harvest	MMCF	140	112	105	91	83	82	26.8
Commercial Thin	MMCF	6	5	5	4	4	4	0.2
% Total	%	4%	4%	5%	4%	5%	5%	1%
5th Decade								
Total	MMCF	146	117	110	95	87	86	27
Final Harvest	MMCF	NA[1]	113	108	80	77	77	20
Commercial Thin	MMCF	NA	4	2	15	10	9	7
% Total	%	NA	3%	2%	16%	11%	10%	36%
LTSYC [1]	MMCF	146.0	120.0	113.5	107.8	94.7	93.8	34.2

[1] LTSYC = Long-term Sustained Yield Capacity.

[2] NA = Not Available.

Table IV-12 Annual Silvicultural Treatments (M acres)

		Alternatives						
Treatment	**Decade**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Regeneration Harvest and Reforestation	1st	14.4	12.6	12.1	10.2	9.1	9.9	3.3
	2nd	NA[1]	12.6	12.1	10.0	9.4	10.0	2.8
	5th	NA	11.8	11.6	8.2	8.1	8.5	2.3
Release	1st	2.2	2.5	2.4	2.0	1.8	2.0	0.7
	2nd	NA	2.5	2.4	2.0	1.9	2.0	0.6
	5th	NA	2.4	2.3	1.6	1.6	1.7	0.5
Precommercial Thinning	1st	10.7	8.6	9.5	6.6	6.7	7.1	1.8
	2nd	NA	11.1	10.5	8.9	7.9	8.6	2.9
	5th	NA	9.2	8.7	7.3	6.8	7.0	2.3
Fertilization	1st	0	10.2	8.8	11.8	9.6	10.2	5.6
	2nd	0	9.2	9.9	7.4	7.9	7.4	2.4
	5th	0	10.1	10.7	7.7	7.3	6.8	2.6
Commercial Thinning	1st	4.2	3.1	3.2	2.6	2.8	2.7	0.2
	2nd	NA	0.2	0.2	1.7	2.1	0.3	0.9
	5th	NA	2.8	1.3	10.1	6.8	5.5	4.9

[1] Data not available.

Effects on Rate of Harvest - Constraints on rate of harvest are used to disperse harvest units spatially so that large openings are not created at any one point in time. The size and shape of created openings varies with resource management objectives. Harvest rate constraints are also used to distribute harvest units over a period of time (temporal) to limit the cumulative effects of timber harvest. In areas where both spatial and temporal constraints apply, the one with the most limiting rate of harvest was modeled.

Constraints on rate of harvest affect the rotation length of a timber stand. Rotation length is the number of years from the regeneration of a new stand to the time of its harvest. Generally shorter rotations (less than 110 years) are designed to increase timber production or achieve economic objectives while longer rotations (more than 140 years) are used to harvest timber while focusing on wildlife, recreation, riparian, and scenic objectives. Table IV-13 shows the range of rotation ages by species, management intensity, and constrained rates of harvest as applied to all alternatives except NC. The percent culmination of mean annual increment (CMAI) volume is also shown, to compare yield potential. Alternative NC was not analyzed with the FORPLAN model and had no constraints which applied directly to the rate of harvest. Areas like streamside zones and scenic corridors had reduced yields to simulate a longer rotation. Comparing the NC alternative to the others is difficult because the yield tables are based on a different grouping of species and site indexes.

All alternatives except NC tend to harvest the unconstrained acres at 95% CMAI to maximize present net value (PNV) and minimize the shortage of stands at rotation age in the 6th to 8th decades. Alternative NC rotation ages are at full CMAI on unconstrained acres. Table IV-10 shows the acres by yield category which can be translated into rotation ages. In this figure harvest rates of 10 and 12% are included in the full yield column while the acres with 7% and 5% harvest rates are in the 75-94% full yield and

50-74% full yield categories respectively. Percent of full yield for Alternative NC is taken directly from the current TM Plan.

Although the actual acres managed on long rotations vary substantially by alternative, they result in a fairly consistent percentage of the total timber yield acres for each alternative except L. The range is from 11% for Alternatives W (PA) and D, 14% for NC, 15% for K and A, and 16% for J. Alternative L manages 43% of the suited lands on long rotations of up to 660 years.

Table IV-13. Rotation Age

			Rotation Age [1]							
Management Intensity	**CMAI**	**95% CMAI**	**At Harvest Rate of 12% Per Decade**	**% CMAI**	**At Harvest Rate of 10% Per Decade**	**% CMAI**	**At Harvest Rate of 7% Per Decade**	**% CMAI**	**At Harvest Rate of 5% Per Decade**	**% CMAI**
Douglas-fir/Hemlock										
PCT & Fert.	67 yrs.	57 yrs.	83 yrs.	97%	100 yrs.	94%	143 yrs.	74%	200 yrs.	62%
Hvy CT & Fert.	117 yrs.	77 yrs.	83 yrs.	97%	100 yrs.	99%	143 yrs.	89%	200 yrs.	72%
FSLC & Fert.	107 yrs.	77 yrs	83 yrs.	99%	100 yrs.	100%	143 yrs.	86%	200 yrs.	71%
Douglas-fir/True Fir										
PCT Only	87 yrs.	77 yrs.	83 yrs.	100%	100 yrs.	99%	143 yrs.	85%	200 yrs.	69%
Hvy CT	117 yrs.	97 yrs.	83 yrs.	91%	100 yrs.	95%	143 yrs.	95%	200 yrs.	79%
FSLC	117 yrs.	97 yrs.	83 yrs.	93%	100 yrs.	97%	143 yrs.	93%	200 yrs.	74%
True Fir										
PCT Only	97 yrs.	77 yrs.	83 yrs.	99%	100 yrs.	100%	143 yrs.	96%	200 yrs.	87%
FSLC	97 yrs.	87 yrs.	83 yrs.	98%	100 yrs.	100%	143 yrs.	93%	200 yrs.	84%
Mountain Hemlock/ Lodgepole Pine										
PCT Only	87 yrs.	77 yrs.	83 yrs.	100%	100 yrs.	96%	143 yrs.	79%	200 yrs.	66%
FSLC	97 yrs.	87 yrs.	83 yrs.	98%	100 yrs.	100%	143 yrs.	90%	200 yrs.	75%

[1] Rotation age and percent culmination of mean annual increment (CMAI) volume are displayed by management intensity, species, and harvest rate per decade.

CMAI = Culmination of mean annual increment.
Fert. = Fertilization.
PCT = Precommercial thinning.
FSLC = Full stocking level control.
Hvy CT = FSLC with one heavy commercial thin.

Riparian Areas

Although riparian vegetation occupies only a small part of the overall acreage of the Forest, these areas provide critical diversity and stability in the forest ecosystem. In riparian corridors along streams, rivers and lakes, the presence of multiple vegetative layers provides a variety of nesting sites, cover areas and food sources for wildlife. The roots of riparian vegetation help to stabilize streambanks and adjacent slopes. Vegetative screening maintains low water temperatures by shading streams from solar radiation, and woody material provides spawning and rearing habitat for anadromous and resident fish. Riparian areas have different microclimates from the surrounding coniferous forests due to increased humidity, a higher rate of transpiration, shade and greater air movement. These conditions are preferred by some wildlife species, as well as by people participating in a variety of water oriented recreation activities during the summer months. Within riparian areas disturbance to vegetation and soils is minimized and harvest rates are reduced or eliminated in all of the proposed alternatives.

Alternatives A, J, and K prescriptions are at the MR levels designed to protect water quality and streambank stability. Alternative D allows no programmed harvest along Class I and II streams, and 5% per decade along Class III streams. Alternatives W (PA) and L have no programmed harvest along Class I, II, and III streams. The effects of these practices on water and fish resources are discussed in their respective sections elsewhere in this Chapter. Alternatives with higher rates of harvest in riparian areas will have the following effects: 1) reduced soil and channel stability, 2) reduced water quality, 3) greater fluctuation of stream flow and ground water, 4) less input of large woody material in future years, 5) greater modification of vegetative diversity, 6) reduced opportunity for quality dispersed recreation, and 7) less habitat for wildlife species, such as primary cavity excavators, optimal thermal cover for big game, and dispersal corridors for species that require interior habitat.

Table IV-14 displays riparian acres by stream class which are scheduled for timber harvest per decade. Also shown is the estimated cumulative percent of riparian harvest by alternative. The actual amount of harvest which occurs will be based on localized watershed and stream conditions. The expected pattern will be a mosaic of partial and no-cut areas from which timber yields are expected to approximate the modelled rate. This table also shows the cumulative percent harvested over five decades. The percents shown reflect the overlap of riparian areas with management areas that do not allow harvest.

Table IV-14 Riparian Harvest Acres and Cumulative Percent Harvested Rate by Stream Class [1]

	Alternatives						
Harvest	NC [4]	K	A	J	W	D	L
ACRES HARVESTED PER DECADE							
Riparian 1 [2]	NA	604	606	508	0	0	0
Riparian 2	NA	667	668	639	0	0	0
Riparian 3	NA	1,289	1,255	1,216	0	826	0
Lakeside							
TOTAL							
Cumulative Percent Harvested[3]							
Decade 1	NA	4%	4%	3%	0	0	0
Decade 2	NA	7%	7%	7%	0	2%	0
Decade 5	NA	18%	18%	17%	0	6%	0

[1]Stream class definitions are in Chapter III, Water.
[2]Riparian 1 refers to the zone adjacent to Class I streams, Riparian 2 along Class II streams, and so forth
[3]Percent harvested of Riparian areas of all stream classes, in all land allocations.
[4]No data is available. In the current Land Management Plan, Class I, II, and III streams were grouped together, and assigned a timber yield of 72 percent of full yield, which approximates a 5 to 7% rate per decade.

Range

The heavily forested land base has limited capacity for grazing of domestic livestock, although there has been some use of the suitable areas for grazing cattle and sheep under fee permits and some free-use grazing of recreational stock. Grazing use on National Forest land by domestic livestock has been a traditional use which has declined significantly over the past five decades. Although many of the older allotments have areas of suitable range, the reduction in the use of Forest land for range can be attributed largely to increasing labor and transportation costs without like increases in livestock returns. Examples include costs of hauling to the allotment and live stock control to keep stock on the allotment. In addition, the establishment of Wilderness has made some areas with historic grazing use unavailable to new applicants.

The effects of the alternatives on the range resource are minimal since permitted livestock use historically has been low and the large amount of forage in range allotments and transitory range is expected to far exceed anticipated demand. Although the quality of transitory range varies by habitat type and terrain, generally the alternatives that harvest more timber provide more transitory range.

Cumulative Effects of the Alternatives on Vegetation

There are approximately 123,000 acres of non-National Forest land within the forest boundary. The management of these lands will contribute to the cumulative effects on vegetation. Harvest on these lands are generally based on economic return rather than non-declining even-flow. Most of these lands have been cutover and are being managed intensively for maximum economic return. For the first two decades of the plan, these stands will be in a young, fast-growing stage of development, providing good watershed recovery, and cover for big-game, offsetting some of the impacts of harvest on National Forest lands. By about the third decade they will be ready for harvest and cutting will likely take place at a rapid pace, impacting watershed conditions and maximizing forage at the expense of thermal cover. In all but a few watersheds, the amount of non-National Forest land is a small percentage and

the effects can be balanced with the management of National Forest land. In some areas, Forest management activities will be influenced by vegetative conditions on private lands.

Cumulative Effects on Succession - All alternatives must meet the S&Gs concerning percent cutover, size and dispersion of units, reforestation, and rotation age. Regeneration harvest under even-aged management will determine patterns of successional stages as timber sale plans are implemented. A greater variety of age classes will be present with stands having greater populations of shade intolerant species. Differences between alternatives are measured by how much of the Forest is affected and the rate at which the effects occur. Alternatives which allocate more acres to timber harvest will gradually result in a balanced array of successional stages between grass/forb and large mature trees on a larger part of the Forest, and a smaller share maintained in old growth. Figure IV-14 shows the difference in alternatives as to acres managed for timber yields. For a typical 100 year rotation, a balanced array of successional stages would result in the following Forest condition on the managed acres: about 5% would be grass/forb, 10% shrub, 15% open sapling/pole, 50% closed sapling/pole/ small sawtimber, and 20% large sawtimber.

The portion of the Forest in no-harvest allocations would remain in, or gradually grow into, the old-growth successional stage (barring natural disturbances such as fire, insects, disease, and windthrow). Non-National Forest lands will generally not be managed beyond the small sawtimber stage.

Cumulative Effects on Diversity - Figure IV-4 shows the relationship between the amount of old growth and the variety of species (plant and animal). At the present time, about 40% of the forested land is covered with old growth. The alternatives differ as to the ultimate balance of successional stages and the time it takes to get there. At the end of the fifth decade, the alternatives are generally at the point where Forest-wide diversity is lowest and when the amount of old growth will begin increasing as the younger age classes begin to move into the old-growth successional stage. After five decades Alternative L has the highest amount of old growth Forest-wide at about 35% of the forested land. Alternatives D and W (PA) are at 24%, followed in order by J, A, and K at 23%, 22%, and 20% respectively. Alternative NC has the lowest amount of old growth after five decades, at 17% of the forested land.

After this point in time, Forest-wide old growth amounts will begin increasing. The highest level would occur after the fifteenth decade. Alternative L has the highest potential with 63% of the forested land capable of old growth. Alternatives D and W (PA) could be at 52 and 49%, followed by J, A, and K at 43, 42 and 38%, and NC at 29%.

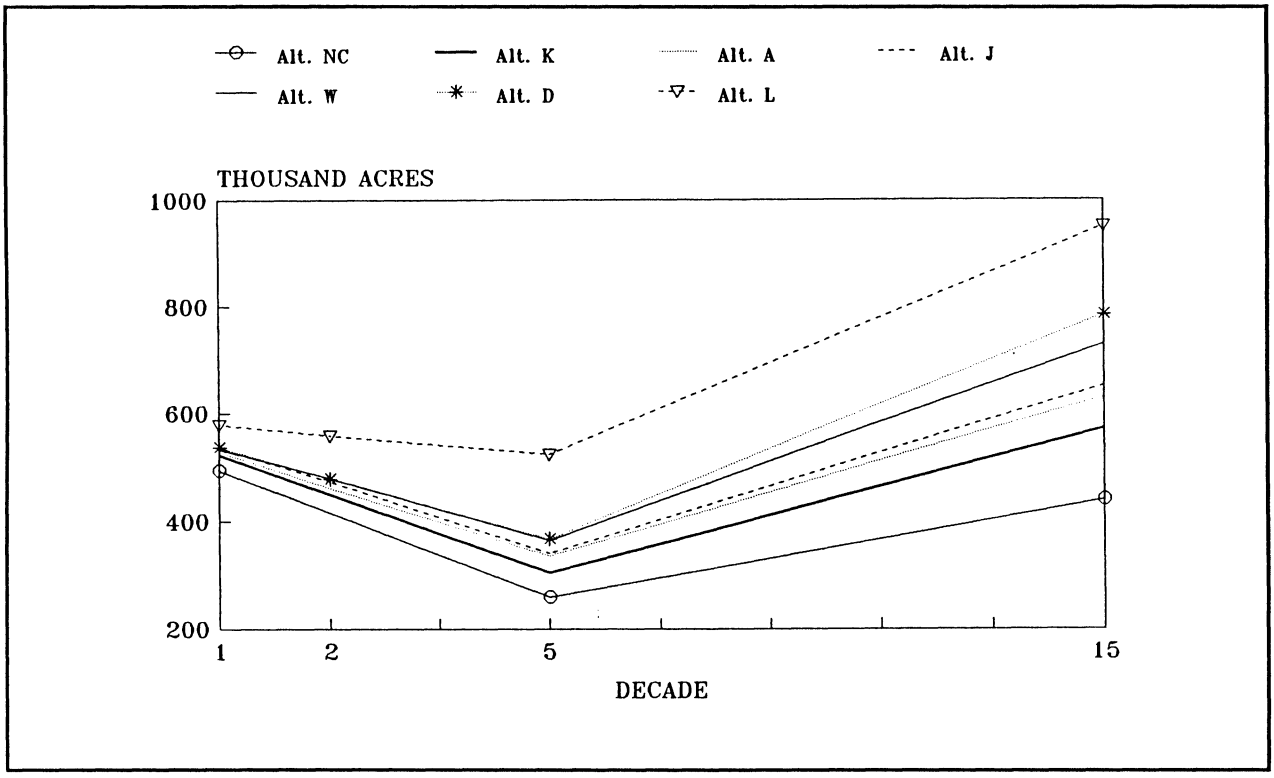
The decline in Forest-wide diversity will occur at a faster rate with alternatives that harvest more acres per decade. The old-growth habitat becomes less effective as it is broken up into small areas by harvest units, and more edges are created. The amount of effective old-growth habitat in harvest allocations will decline more rapidly than the actual acres of old-growth trees. Application of a "minimum fragmentation" strategy can delay or reduce this effect, and is an option with all alternatives where appropriate. Table IV-12 shows the difference in acres harvested for decades 1, 2, and 5.

Cumulative Effects on Old Growth - Figure IV-7 shows the amount of old growth remaining by decade for each alternative. By the end of the fifth decade most of the old growth on lands allocated to full timber yield will be gone. Management areas in retention middle ground and foreground will be maintained in a late mature or old growth stage of development, but are not specifically preserved like wilderness or Old-Growth Groves. As the harvest of old growth proceeds, the effectiveness of remaining old-growth habitat will diminish because the larger blocks of old growth will be gradually broken up by harvest units. The old growth that is set aside in each alternative is in large enough blocks to provide effective habitat on a continuous basis and will generally be connected by riparian corridors. The end of the fifth decade generally marks the low point of old growth acres for each alternative. Alternative L maintains the most old growth with about 523,100 acres. Alternative D is next with 367,800 acres, followed in order by W (PA) (365,200), J (341,400), A (337,000), K (305,100), and NC with the lowest cumulative total after five decades of 259,800 acres.

After five decades, the amount of old growth will begin rising as harvest occurs increasingly in regenerated second growth stands, and the younger age classes in no-harvest allocations gradually become old growth. The actual amount of old growth in no-harvest allocations will depend on the occurance of fire or other disturbances. After 15+ decades, Alternative L has the potential to exceed current levels of old growth with about 951,400 acres. Alternative D has a potential of 785,100 acres, followed by W (PA) (729,900 acres), J (651,100 acres), A (630,200 acres), K (571,700 acres), and NC with the least potential at 440,100 acres.

The 123,000 acres of non-National Forest lands will have little or no cumulative effect on old growth. There are less than 3,000 acres (2.5%) of old growth remaining at the present time. Most of the remaining acres that are manageable will soon be harvested. These non-National Forest lands will generally be managed on relatively short economic rotations and will not provide old growth in the future.

Figure IV-7. Old-Growth Acres



Cumulative Effects on Timber - The magnitude of the following cumulative effects will depend on the total acres managed for timber production. Table IV-9 shows the total acres with timber yields for each alternative.

In general, alternatives which harvest more acres will gradually result in younger age classes, fewer stands of old-growth, and a younger average age of timber stands in the Forest. Along with the younger ages will come smaller average tree sizes. There will be less defect and breakage as diseases found in mature and overmature trees have less chance to develop in the younger stands. The amount of acreage in age classes from 100 to 200 years will decline in the future as the majority of the managed stands will be on rotations of 60 to 100 years, and the unmanaged stands continue to age. Laminated and blackstain root rots may show some increase with intensive management, but losses can be minimized by planting and favoring resistant species and timing precommercial thinning to minimize spread of disease by insects seeking out the fresh cut stumps.

For all alternatives, the total volume of standing trees (5"+ dbh) on land allocated to timber management will be less at the end of the planning period than at the beginning. Standing volume will decline over a period of decades until a point of equilibrium is reached where growth equals harvest (decade 2-5). Per acre growth rates will be greater at the end of the planning period than at the beginning, on timber management acres, because regenerated managed stands grow at a faster rate than existing unmanaged stands.

The per acre yield of commercial products from the Forest will increase as stands are managed to maintain fast growth rates by controlling competition. Growth will also be enhanced through fertilization

and genetic selection. Cross-breeding for desirable genetic traits will provide greater increases in successive generations. Care must be taken to avoid reducing genetic diversity which could make the Forest increasingly susceptible to insects and disease. All alternatives meet or exceed the requirement that the growth rate by the year 2030 be 90% of LTSYC. Concerns about maintaining long-term productivity are addressed by the S&Gs that minimize soil compaction and erosion, and maintain large woody debris within harvest units.

Future firewood supply will be dependent on the health and age of forest stands being harvested, and prescriptions for removal and piling of unmerchantable material to provide planting spots and/or reduce fuel accumulations. The availability of firewood will decrease over time with the implementation of any of the alternatives, as harvest shifts to regenerated, managed stands with less cull material.

Cumulative Effects on Riparian Areas - In the overall forest setting, riparian areas are relatively high in diversity of plant and animal species. Harvesting adjacent to these areas will change the species composition by allowing more light to reach the ground favoring the more shade-intolerant species. As harvest progresses in and adjacent to these corridors, the risk of blowdown will increase. Construction of roads associated with harvest will reduce vegetation, particularly along Class III streams where there is more area that still requires road access in order to conduct management activities.

Figure IV-9 shows the differences between alternatives as to the number of riparian acres that will eventually be harvested. The data for Alternative NC is not available. Alternatives K, A, and J are all very close with 17 to 18%, Alternative D will harvest 6% in Class 3 only, and Alternatives W (PA) and L harvest no riparian acres at all along Class I, II and III streams.

For all alternatives that harvest riparian areas along Class I and II streams, the rotation age is 200 years, which will result in large mature tree to old growth successional stages. For alternatives that harvest riparian areas along Class III streams, the rotation age is 140 years which will provide trees in the large mature successional stage.

Cumulative Effects on Range - Livestock grazing can cause surface compaction around salt blocks or watering areas, fences, loading ramp facilities, and trails. Over time, compaction alters plant composition and may even eliminate plants almost all together. In some areas, frost action tends to break up surface compaction and some of the polygonium species will establish on areas that are not severely compacted. However, if the situation occurs over too long a period or if the areas are continually overused, vegetative density and composition can change. On domestic range allotments where meadow habitat types are grazed, naturally moist meadows and other areas may receive damage if not managed to maintain desired plant species composition.

Relationships with Other Agency Plans or Policies for Vegetation

The S&Gs associated with vegetation management activities in this Plan will meet or exceed those found in the plans of other agencies.

The Forest Plan incorporates the Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation. In implementing the Forest Plan through project activities, the Forest will comply with the Record of Decision issued by the Regional Forester dated December 8, 1988, and the Mediated Agreement of May, 1989.

Mitigation Measures for Vegetation

A wide range of mitigation measures can be used to avoid, minimize, rectify, reduce, or compensate for undesirable environmental impacts to vegetation. These types of mitigation will not vary by alternative, although the degree to which they will be applied will be relative to the amount and location of activities which disturb or remove vegetation. Mitigation measures include the protection of the basic soils resource to maintain productivity, and protection from damage as a result of fire, insects, or disease.

Openings will not be created adjacent to any natural openings such as meadows, cliffs, caves, and talus areas, unless adequate vegetation along the edge can be developed or retained in sufficient density to protect wildlife values and visual management objectives. To minimize disturbance to natural openings, management activities will be planned in a manner sensitive to site productivity, microclimate, and special wildlife or plant habitat needs. Where practicable harvest systems, schedules, and patterns will maintain late seral stage timber in at least 30-50% of the edges of these areas, also dead and defective tree habitat is maintained when safety conditions permit.

Forest openings created by even-aged silviculture will not exceed 60 acres unless otherwise justified (36 CFR 219.27(d)). The Regional guide allows exceptions for catastrophic events (fire, insects, wind); use of logging systems to reduce damage to soil, water, and other resources; to reduce the spread of diseases (mistletoe, root rot) from adjacent stands; and to improve scenic quality by shaping and blending units to fit the land-form. The S&Gs further restrict unit sizes within some Management Areas. Sizes range from one acre maximum in the retention foreground areas to thirty acres in modification background areas. Harvest rates for these areas vary from 10% to a more limited 5% per decade.

There are a number of methods that are used to minimize impacts on vegetative diversity. These include protecting non-forested areas; planting a mix of commercial timber species to simulate natural conditions; managing noncommercial vegetation to maintain a variety of ecoclasses and successional stages; and maintaining old growth in no-harvest allocations. If Federally listed threatened or endangered plant species are identified, recovery plans will be initiated and the USDI Fish and Wildlife Service will be consulted. Timber management or other activities will be modified or eliminated to meet the requirements of the Endangered Species Act of 1973. Species classified by the State of Oregon, as being threatened or endangered, will also receive the protection necessary to insure viable populations.

A number of logging techniques are used to protect residual regeneration, forage, seed trees, or wildlife trees which could be damaged by timber harvest activities. These techniques include scheduling of activities when vegetation is less susceptible to damage; suspension of logs during skidding; skidding logs over a designated depth of snow; and designating buffer corridors. Riparian areas have different logging requirements to minimize disturbance to vegetation. In Alternative W (PA) and L, timber would not be harvested in riparian zones; the other alternatives would allow harvesting at different rates (see Table IV-9).

Riparian areas will be maintained as habitat for riparian-dependent resources. Measures include project design that maintains vegetation both vertically and horizontally, resulting in greater plant and wildlife diversity; wildlife migration routes and travel corridors; and dead and decaying tree habitat. In addition, along perennial streams the existing cover directly above the channel and within 20 vertical feet of the stream surface will be maintained at 60% or greater of the existing natural level.

Damage to vegetation as a consequence of recreation use is minimized by a number of practices. Healthy native vegetation will be maintained around campsites and the loss of trees as a result of human activity

will be avoided. Vegetation at these sites will be monitored for adverse losses. The size of groups and groups with trail stock will be limited in dispersed camps. Dispersed camping areas are to be located more than 100 feet from lakes, streams, trails, and key interest features in some of the Management Areas.

Experience in mitigating potential adverse impacts on vegetation has been gained on the Forest in places such as Jefferson Park in the Mt. Jefferson Wilderness. Here in the late 1970s the vegetation was suffering from intensive use by campers. By 1980 it became the practice for Wilderness rangers to instruct campers about the need to preserve the vegetation and disperse camps away from the lakes. By dispersing camps with a 200 foot set back, vegetation began recovering. String fences were used to delineate and protect areas that were rehabilitating. Seed from native vegetation was gathered and used to rehabilitate areas damaged by concentrated use.

To regulate and monitor collection activity, and avoid potential harmful impacts a permit is required for collection of vegetative material including ferns, seedlings, bear grass, tree boughs, Christmas trees, and cascara bark. Rehabilitation projects, trail and area closures, and visitor contact can be implemented when necessary.

A wide range of activities can be used to avoid, minimize, or compensate for impacts to timber quantity and quality. The types of these measures will not vary by alternative, but the degree to which they are applied will depend on the amount and location of timber harvest. Alternative NC does not include the use of fertilizer.

Decreases in allowable harvest levels can be mitigated in two ways, by increasing the number of acres available and suited for timber management and by increasing yields from each acre. Research is ongoing to find cost-efficient methods of reforesting unsuited soils within five years of harvest. Research is aimed at providing safer and more effective ways to release trees from competition and protect them from insects, disease, and animal damage. These efforts result in earlier establishment and faster growth. Forest soil types are being tested to determine if the increased tree growth off-sets the cost of fertilizer. The genetic improvement program is moving into the next stage with the establishment of seed orchards. The present yield table uses a 10% increase in yield for using seed from superior trees in reforestation. Additional gains may be possible by further testing and cross-breeding these superior trees in seed orchards.

Higher yields may also result from new technology allowing commercial thinning over longer distances with less damage to residual trees. About two-thirds of the suited land base is accessible for thinning. New technology and more widespread use of existing techniques like directional felling can increase yields by reducing breakage and increasing utilization of wood that is presently left on site or burned to prepare the site for planting.

A range of controls is available to prevent damage to seedlings in plantations. These are found in Appendix D, General Management Standards, Vegetation Control and Integrated Pest Management. These control damaging agents such as wildlife, plant competition, disease, and insects. An example of reducing animal damage to seedlings is the use of vexar tubing placed over the tree to prevent browsing or clipping by wildlife. Burning of logging slash removes cover for hares, mountain beavers, woodrats, porcupines, and other small mammals. Burning also slows growth of vegetation for several years and lessens competition for light and moisture (Black and Hooven 1978).

The timing of these measures can be critical to their success and to minimizing their impacts. For example, slash burning must be accomplished when fuel moisture levels are dry enough to reduce slash to desired levels, but duff is wet enough to prevent the burn from becoming too hot and damaging

the soil. Another example is timing precommercial thins to avoid the spread of blackstain root disease by beetles attracted to the fresh cut stumps.

Detailed silvicultural prescriptions will address environmental conditions that pose a limitation to a species that is not exclusively adapted to the conditions that are present. An example is planting a mix of species. The silvicultural prescription will also be guided by the S&Gs that will limit size of openings, harvest rates, and disturbance according to Management Area. (See Chapter IV, Vegetation.) All the various forms of even-aged regeneration cutting will be available for use including clearcutting, shelterwood, and seed tree. Where appropriate, uneven-aged management will be accomplished by group selection in some Management Area Prescriptions.

Pruning is another measure that may be used in the future to mitigate impacts on wood quality due to younger age classes and smaller tree sizes. The removal of lower branches can encourage high quality, high value clear wood not otherwise found, except in old-growth trees.

Careful design, layout, and administration of the harvest operation can increase yields by protecting site quality, reducing breakage and logging damage to residual trees, and minimizing the risk of windthrow and escaped slash fires.

Decreasing supplies of firewood in the future can be mitigated to some extent by considering non-traditional sources such as precommercial thinning and commercial thinning slash, and through small sale or salvage sale programs.

On lands that are suitable and available for domestic livestock grazing, permits and the Range Allotment Plans will distribute and limit the number of animals on each area. Range Allotment Plans are revised and updated on an annual basis. This interaction promotes the resolution of environmental issues and the anticipation of potential conflicts.

The control of noxious weeds that are toxic to livestock is achieved on the Forest without the use of chemicals. Biological forms of control are administered by the State of Oregon. Allotment Plans promote grazing rotation to reduce the amount of thistle and other pasture weeds. Mechanical pulling of undesirable vegetation may be implemented if necessary.

A number of mitigation measures can be utilized to reduce or minimize undesirable impacts to range and grazing resources. For example, salt block and watering locations are periodically moved to promote optimum grazing patterns and minimize long term animal concentrations and soil compaction. Range improvements and maintenance projects can also be utilized to prevent resource damage and to sustain the productivity of existing permits.

Environmental Consequences Of The Alternatives On Fish

Introduction

Thirty species of native and naturalized fish live in aquatic habitat within the waters found on the Forest. Although historically fish populations on the Forest have declined slightly, commercial and recreation industries are still supported in part by Forest fish resources. The management and enhancement of fish habitat by the Forest Service and the Oregon Department of Fish and Wildlife (ODFW) has had a positive correlation with recreational use and values. Fishery related businesses include those of guide services, motels, restaurants, processing plants, and of boat and equipment dealers.

Direct and Indirect Effects of Alternatives on Fish

Although all fish species are considered important, only the anadromous salmon and resident trout species are considered as management indicator species (MIS) on the Forest. These species were selected because of their value as sport and commercial fish species and because they have special habitat requirements that may be significantly influenced by management practices.

Both fish production and habitat capability are important measures of fish habitat conditions on the Forest. While many relationships between fish and their habitat are complex and not every detail is completely known or thoroughly understood, biologists do know that the ability of a species to inhabit a given environment successfully is dependent on a number of factors which ensure the basic survival and reproductive requirements of the species. These factors are water temperature within minimum and maximum tolerances, spawning gravel within size limits used by each species, adequate food supplies, and living space for protection against excessive predation and severe hydraulic events.

Anadromous Fish - The effects of proposed activities on anadromous salmonids is described with a smolt habitat capability index (SHC). This index was based on the best available information and coordination with Oregon Department of Wildlife. The Index can be adjusted as new and better information becomes available. (See Monitoring, Chapter V of the Plan.) Three major factors influence the effects of an alternative on SHC; elimination of major barriers to fish passage by other agencies; the level of enhancement projects provided by each alternative, and the level of timber harvest in and adjacent to riparian areas.

The existing SHC is estimated at approximately 169,000 smolt, from 139 miles of existing anadromous fish habitat. These numbers reflect a low number of returning chinook, to the McKenzie River, and low returns of winter steelhead to Fall Creek and the Santiam River. The potential SHC of this habitat is estimated at approximately 437,000 smolt assuming adequate adult escapement to fully seed existing freshwater habitat.

All alternatives propose to provide rehabilitation and enhancement of approximately 60 miles of the existing habitat. The full effectiveness of these projects may not be seen until the second decade when the SHC would be at over 500,000 smolt.

The elimination of major barriers to passage for spring chinook in the South Santiam, and McKenzie watersheds would add an additional 106 miles of habitat, and would improve smolt production and potential adult anadromous fish escapement in all alternatives. These projects are primarily under the jurisdiction of the Army Corps of Engineers, Oregon Department of Fish and Wildlife, and Eugene Water and Electric Board; agencies with which the Forest will work with cooperatively to increase the

miles of available habitat. The completion of these projects is expected to increase smolt habitat capability by an additional 500,000 smolt the first decade. Habitat rehabilitation and enhancement projects on 30 miles of the potential habitat would increase the smolt habitat capability by almost 800,000 over existing habitat levels during the second decade. These projections also assume harvest regulations that allow sufficient adult escapement to fully stock the habitat.

In addition to instream improvements, several types of on-Forest enhancement projects would increase anadromous fish populations. These projects focus on expanding the utilization of anadromous fish habitat to presently unoccupied sites by hauling adult fish around small, on-Forest barriers such as waterfalls; and by increasing smolt production through the use of egg incubator boxes along streams.

Timber harvest within the riparian area and adjacent to the riparian areas has direct impacts to the fishery habitat. The processes which create the changes to aquatic habitat are described in more detail in the Water section of this chapter. These processes focus on changes in riparian conditions, levels of sediment, and changes in runoff patterns. The assessment of the influence of timber harvest on smolt habitat capability is based on the same three parameters.

Tree removal within the riparian areas reduces a number of important fish habitat components. When riparian trees are removed, so is the source of fine organic material which is used as food or cover for aquatic food organisms, is no longer available. The large woody material (LWM) such as limbs, boles, and root wads that interact with hydraulic forces to cause gravel sorting, scour, and ponding are no longer providing that function. Reduction of habitat diversity and productivity is reflected in the reduced fish availability.

At least one side of at least 39% of Class I, II, and III streams had already lost the stream-side vegetation, the effect will be long-lasting. Recovery of hardwood vegetation to 75% canopy closure takes approximately 25 years. Recovery of full-sized conifers may take up to two hundred years to produce future large woody debris where hardwood species have become dominant in riparian areas.

When trees in the riparian areas are harvested, there are other indirect effects to the fish habitat. Riparian areas along streams and lakes act as filter strips that trap sediment and sideslope debris from adjacent roads and harvested areas. Riparian areas become less efficient filter strips as trees are removed allowing the sediment and debris to reach adjacent streams. Excessive sediment has the potential to deposit in slow moving areas, reducing the dissolved oxygen to salmonid eggs and alevins. (Chapman and McLeod, 1987) Debris torrents and rocks can destroy fish habitat by washing out in-stream cover filling, in rearing pools, and reducing the habitat diversity within a stream. Removal of trees within the riparian areas also causes reduction in root strength and increases the risk of erosion through streambank and streambed scouring.

In the alternatives, the maximum rates of harvest per decade in riparian areas vary. Alternatives K, A, and J emphasize commodity production with low to moderate emphasis on amenity resources such as fish. The fish resource is not considered a high commodity resource and these alternatives would allow the greatest amounts of harvest in the riparian areas associated with Class I, II, and III streams. In these alternatives, a 5% harvest rate per decade is allowed in the riparian areas associated with Class I and III Streams, and a 7% rate of harvest in riparian areas associated with Class III Streams. These alternatives would allow a 10% harvest rate in lakeside riparian areas. In Alternatives K, A and J, there would be a reduction of food supply and large woody debris in the stream compared to the other alternatives.

Alternatives W (PA), D, and L have a higher emphasis on fish resources. Alternatives would allow no harvest in riparian areas associated with Class I and II areas, and 5% harvest in riparian areas associated

Class III stream areas. Alternatives W (PA) and L would allow no programmed harvest from Riparian areas adjacent to Class I, II, and III streams. These alternatives would allow no harvest in riparian areas adjacent to lakes. Food and nutrient supply levels as well as large woody debris recruitment should be higher in these three alternatives than in Alternatives K, A, J.

Table IV-15. Smolt Habitat Capability Index

	Alternatives						
	NC [1]	K	A	J	W	D	L
Smolt Produced [2]							
FIRST DECADE							
Existing Habitat	NA	392	397	410	437	432	437
Potential Habitat	NA	439	443	458	488	433	488
TOTAL		831	840	868	925	865	925
SECOND DECADE							
Existing Habitat	NA	616	621	641	681	674	681
Potential Habitat	NA	686	692	716	763	676	763
TOTAL		1302	1313	1357	1444	1350	1444

[1]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model.
[2]Thousands of smolts

Harvest levels would be less in Alternatives W (PA), D, and L than in the others which result in fewer acres being disturbed due to road building or harvesting of units. The mass wasting levels are expected to decline significantly under Alternatives W (PA) and L, which provide additional direction for protection of Class IV streams and potentially highly unstable landtypes. The risk of adverse effects from mass movement during major storm events, is discussed in the Water section. Mass movement, at rates increased above natural levels, has the potential for damage to fish, as debris fills pools, and increases levels of fine sediments in spawning substrate. First decade erosion levels are below levels in previous years based on the occurrence of normal storm events.

Alternatives W (PA), D, and L would produce the highest levels of smolt (over 560,000 smolt) from existing habitat during the first decade, while Alternatives A, K, and D would produce between 500 and 550 thousand smolt. Per decade harvest rates and smolt populations were not determined for Alternative NC. However, due to increased instream sediment loads, smolt populations are expected to be lower than population estimates in Alternative K.

Erosion in the stream would be higher in Alternatives K, A, and J, compared to the other alternatives due to increased road building at the higher elevations and head wall areas to meet the objective of higher harvest levels. A larger proportion of the road building and harvest activities would occur adjacent to Class III, and IV streams where much of the available timber still remains.

Resident Trout - The habitat capability for resident trout populations would be influenced by streamside cover, woody debris and erosion as with anadromous fish, but to a lesser degree Forest-wide. The majority of trout production sites are located in reservoirs and in Wilderness lakes, and in the McKenzie River system. The lakes are less affected by timber harvest activities than are streams and rivers. In-stream production is a small portion of trout production on the Forest and much of the in-stream production is also supplemented with hatchery stock.

All alternatives would complete 1335 acres of reservoir improvement, presuming adequate funding and technological developments. Alternatives W (PA), D, and L would accomplish an additional 118 acres of streamside improvement for resident trout. As a result, there is only a 3% difference in trout populations based on habitat capability between Alternative L and Alternative K; Alternative L would produce 2,505,900 legal size trout and Alternative K would produce 2,426,800 fish in the first decade. All of the alternatives, except Alternative NC, manage for over 97% of the biological potential for resident trout. Population outputs for trout were not determined for the No Change Alternative.

Sensitive Species - Two fish species currently listed as Sensitive in the Region are bull trout *Salvelinus confluentus*, and the Willamette Oregon chub *Oregonicthys crameri* exist on the Forest.

Bull Trout populations are currently found in the McKenzie sub-basin, including the South Fork McKenzie. Historically the populations were also found in the Middle Fork Willamette and North Fork Middle Fork Willamette, and the North Santiam. Currently an multi-agency group including U.S. Forest Service, Oregon State University, Oregon Department of Wildlife, and National Park Service, are cooperating to evaluate the status of the populations.

Many of the factors which limit these populations are not yet understood, however it is known that water temperature is important for initiation of breeding, for embryonic development, rearing, and for adult habitat. They are seldom found in tributaries with summer temperatures exceeding 18 degrees C, and are often found near cold perennial springs. (USDA Forest Service, 1989)

Alternatives W (PA) and L provide the best protection of this species, because no harvest is programmed from riparian areas in these alternatives, and risk of increases in stream temperature is low. It is possible that future management of this species may require reestablishing it in its historical species. This would be made more difficult under alternatives with programmed harvest in riparian areas due to a greater probability of increases in water temperature.

The Willamette Oregon chub was historically widespread throughout the Willamette drainages, and is now restricted to scattered populations along 15 miles of the Middle Fork Willamette. This species inhabits areas with primarily slow velocities, such as those created in overflow channels of flooding rivers. The containment of the Willamette River for flood control purposes has reduced the historical habitat of this species. Population declines may also be due to competition from introduced species. (Pearsons 1989)

The Fish and Wildlife Service was petitioned in the spring of 1989 to list this species as Threatened. The agency will follow the established procedure in making the determination of status. Management of habitat for this species will be based on recommendations developed in cooperation with ODFW. These would be followed under all alternatives.

Cumulative Effects on Fish - Many of the Forest's fish are anadromous fish, and as a result, utilize both on Forest and off Forest habitat. The construction of reservoirs by the Army Corps of Engineers has interfered with access to and from the potential habitat on the Forest and has totally blocked access to 66% of it. Continued interference with emigration and immigration due to management of interspersed private land may prevent the Forest habitat rehabilitation efforts from becoming fully effective and populations from reaching levels where the available habitat would be fully utilized.

Both habitat capability and fishery populations are expected to increase in the future due to rehabilitation projects. In the short-term, bedrock-control type streams would be rehabilitated more rapidly due to advances in current technology. Glacial out-wash type streams would be harder to rehabilitate because hydraulic responses are less predictable and the base of current knowledge for anchoring large structures within streams is still on-going. Over time, habitat projects that improve fish passage around reservoirs will provide access to additional habitat.

Mitigation Measures for Fish

The management activities that take place in the Forest's watersheds are governed by standards and guidelines that specify ways to protect features of quality fishery habitat for water temperature and turbidity. On a site specific basis, additional mitigation measures can include a wide range of actions that avoid, minimize, rectify, reduce or compensate for undesirable environmental impacts on the fishery resource.

The degree to which they will be applied will be relative to the amount and location of the activities proposed by the alternatives and site specific impacts. For example, Knutson-Vandenberg Act funding opportunities for fish habitat improvement projects would be higher in alternatives with high levels of timber harvest to mitigate for adverse conditions caused by timber sales and road construction.

Habitat improvement projects can be specifically designed to establish desirable habitat conditions and also to correct past adverse impacts on fish resources. Proposed projects should be evaluated for need as well as cost-effectiveness. Special projects can include cleaning spawning and rearing beds, rehabilitating riparian areas, improving fish passages, and modifying stream structure with gabion construction or logs to create more diverse habitats and improved pool/riffle ratios.

In Alternative W (PA), protection of the vegetation in the areas within 100 feet of perennial streams, wetlands, flood plains, lakes and other large water bodies will reduce impacts on fish habitat. The existing vegetation will be utilized to shade the stream channel and to reduce erosion. Large woody debris will be maintained in perennial streams and lakes at a minimum of 90% of the existing level. In certain site specific upland areas adjacent to these riparian corridors, soil and vegetative disturbance will be minimized by requiring suspension of logs during logging. Disturbance during yarding operations can also be minimized by directional felling of trees.

Protection of water supplies for hatcheries can be accomplished by many of the same site specific measures previously discussed, and those discussed in the Water section.

Road construction, reconstruction, or maintenance projects adjacent to or within streams can increase deposition of sediment and cause temporary impacts on water quality. Potential adverse effects to fish can be minimized by scheduling work outside of spawning or migration periods, and during slack fishing periods. Scheduling work during normal dry seasons will allow newly disturbed areas sufficient time to be rehabilitated prior to the rainy season. Deposition of sediments can be reduced by designing roads and access routes to minimize road cut and fill erosion, and by reseeding and replanting exposed areas (Reeves 1982).

Debris jams that impede fish migration, or remove suitable spawning areas from production, may be removed as long as removal does not adversely affect stream gradient and configuration. The debris may be removed in phases, and conditions can be monitored periodically. When a culvert hinders or blocks upstream access, replacement may be the best approach, and new culverts can be positioned to protect fish habitat. Culverts can be placed to allow sediments to accumulate, creating dart and rest areas for small fish. Road reinforcement structures such as pilings or walls can also be placed to form slow moving pools within a stream (Reeves and Roelofs 1982).

Fishing is a form of dispersed recreation that directly affects fish populations. To a large degree, ODFW regulates the level of fishing by setting catch limits and seasons. Developed sites tend to concentrate fishing pressure which often decreases fishing success, although increased fishing pressure may be beneficial to some brook trout populations where fish size is stunted due to overpopulation. Trampling of riparian vegetation near streams and lakes can also impact fish habitat. Damaged sites can be rehabilitated and restrictions can be placed on dispersed campsite locations and conditions. Access sites for fish liberation trucks can be spaced to allow a better distribution of fish and provide dispersion of anglers.

Relationships with the Other Agency Plans or Policies for Fish

There are a number of plans and policies formulated by other parties with regard to the management of the aquatic habitat. Most of these plans and policies have elements that deal specifically with fish habitats. In general, they address two basic elements of fish habitat: (1) the maintenance of existing habitat; (2) the restoration, rehabilitation, and/or enhancement of fish habitat.

Four pertinent plans or programs:

- *The Columbia River Basin Fish and Wildlife Program, 1984*, (Northwest Power Planning Council). This plan was prompted by passage of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 95-501). This plan emphasizes the restoration of Columbia River anadromous fish runs diminished by basin-wide hydroelectric development and operation. Restoration provisions include protecting fish survival, encouraging their reproduction, and rehabilitating and enhancing their habitats in the Columbia River and its tributaries.

- Sub-basin plans for the Santiam, Calapooia, McKenzie, Middle Fork Willamette and Willamette mainstem are currently being reviewed for consistency with this plan. Upon adoption by Northwest Power Planning Council and Bonneville Power Administration, they will have a profound effect upon all agencies responsible fish and fish habitat. These sub-basin plans will establish specific goals and prioritize habitat investments.

- *Comprehensive Plan for Production and Management of Oregon's Anadromous Salmon and Trout, 1982* (Oregon Department of Fish and Wildlife). This statewide plan deals with all major anadromous species. Habitat management considerations focus on the maintenance and improvement of anadromous fish habitat.

- *Oregon Wild Fish Policy* (Oregon Department of Fish and Wildlife). This policy formally recognizes the need for habitat-based, wild, and natural fish production.

- *Willamette Basin Fish Management Plan*, 1988 (Oregon Department of Fish and Wildlife). A key feature of this plan is a section that emphasizes the importance of maintaining fish habitat to ensure fish populations remain at high levels.

Inadequate information

Inventory of quantity and quality of aquatic habitat suitable for spawning, rearing and feeding of salmonid Management Indicator Species.

Smolt density coefficients derived from site specific studies.

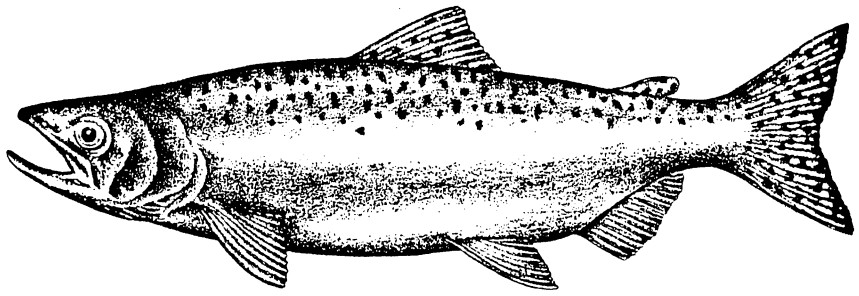
Determine thresholds of sediment and turbidity above which negative effects on fish and fish habitat occur.

Determine the role of food sources from Class III and IV streams on Class I and II habitat.

Determine the influence of gravel stability on the survival of salmonid eggs and fry.

Determine the amount of instream large woody material necessary to meet objectives for fish production.

Assess the results of stream rehabilitation projects on fish population dynamics.
Bull Trout habitat, populations, distribution, and other characteristics as described in the "Research Needs" section of "Biology of the Bull Trout" Willamette National Forest, 1989.



Environmental Consequences Of The Alternatives On Wildlife

A diverse array of wildlife species reside on the Forest. More than 170 avian species, 64 mammalian species, and 30 amphibian and reptilian species use habitats found on the Forest for all or a significant portion of their life history needs. Numerous physical, biological, and environmental factors interact at stand and landscape levels causing the number of individuals within populations to fluctuate over time. These fluctuations can be natural or caused management activities. Management activities have direct, indirect, and cumulative effects on wildlife populations and their habitats.

Particular species have been chosen as management indicator species (MIS). Management indicator species represent a broad group of species dependent on, or associated with, similar habitat conditions. The primary assumption used in the indicator species concept is that by managing for viable populations of indicator species, the viability of all other species that require similar habitats will be maintained. This group of wildlife species serves as one measure of vertebrate diversity across the forest.

A discussion on the selection of MIS and the habitats they represent is presented in Chapter III, Wildlife.

Direct and Indirect Effects of the Alternatives on Wildlife

Diversity of Vertebrate Species - All of the alternatives, except No Change, have been designed to provide for a diverse mix of wildlife habitats capable of sustaining viable populations of native and desirable non-native vertebrate species. Some wildlife populations are directly impacted during management activities such as timber harvest, road construction, mineral extraction, and fire. Small mammals, reptiles, amphibians, and nesting bird species are most likely to be directly impacted because of their limited mobility. Significant population loss throughout the Forest would rarely occur as a direct effect of management activities, but localized segments of the population could be lost or isolated. Management activities involving the release of species could directly increase populations in localized areas. Examples would include transplanting elk or release of peregrine falcons.

Indirect impacts to wildlife species are more subtle and vary greatly depending on the amount of habitat loss, change, or disturbance. Changes in habitat composition, structure, and distribution results in subsequent shifts of species composition and population densities within the Forest as well as off the Forest. Some species are migratory, using habitat on the Forest during breeding seasons and then moving to other locations during winter months. Others, such as elk, migrate from higher portions of the Forest to discrete wintering grounds on other portions of the Forest. In addition, a species' habitat requirements may change through the year, with nesting or calving requiring one type of habitat, while feeding or protection from the weather may require another.

The No Change Alternative (NC) does not incorporate the provisions of the National Forest Management Act (NFMA) requiring diversity of animal communities be maintained and maintenance of habitats for well distributed viable populations of vertebrate species. Wildlife populations are at greatest risk in Alternative NC. Habitat provisions in the current forest management plan (NC) would meet Recovery Plan requirements for federally listed threatened and endangered species.

All alternatives except NC, rely on the MIS strategy to meet the diversity intent of NFMA. The selection of MIS species is described fully in Chapter III. Each alternative results in different habitat characteristics and distribution.

Management Requirements for habitat quality, quantity, and distribution for MIS are met in Alternatives A, J, K, and W (PA). Alternatives D and L provide habitat levels which exceed Management Requirements

(MRs). Alternatives J, W (PA), D, and L, respectively, provide increasing protection for special and unique habitats reducing the risk of losing species diversity.

Northern Bald Eagle: Threatened Species - The northern bald eagle is federally listed as a threatened species. As identified in the Pacific States Bald Eagle Recovery Plan (1986), the population recovery objective for the Forest is 20 pairs of bald eagles. Protection and enhancement of bald eagle habitat must include consideration of nest sites (current, future,and replacement), roost sites, and foraging areas.

Chapter III, Wildlife, describes the habitat requirements and Recovery Plan objectives for the bald eagle. Figure IV-16 displays bald eagle habitat by alternative.

Management activities proposed in all alternatives that would directly impact bald eagles are timber harvest, road construction and maintenance, and recreation developments. Allowing these activities to occur in and around occupied territories could directly impact bald eagles by causing them to avoid or abandon nest sites, roost sites, or foraging areas (Anthony, 1990 personal communication).

Indirect effects could also occur, impacting the potential recovery of the bald eagle. Indirect effects to bald eagles include management practices that reduce habitat suitability by harvesting potential nesting or roosting habitat, result in significant reductions in potential food resources, or allow disturbance in key use areas, causing abandonment or precluding establishment of a territory.

Alternative NC (No Change) would comply with the Threatened and Endangered Species Act of 1973, as amended, and the Pacific States Bald Eagle Recovery Plan. Bald eagle habitat would be managed to meet established Management Requirements (MRs). Alternatives A and K manage bald eagle habitat at the MR level. Alternatives J, W (PA), D, and L increase the potential for population recovery. Alternative W (PA) would increase protection around potential and existing nest sites to at least 125 acres and would require biological evaluations of all activities occurring within 1.1 miles of eleven major water bodies with known or high potential for bald eagle territories. Alternative J would manage for the same number of sites as Alternative W (PA), but the potential nest sites would average 30 acres in size. This is smaller than recommended for protection of nest areas (Anthony 1989). Alternatives W (PA), D and J provide protection of additional potential nest sites above that required in the Recovery Plan and would include habitat provisions as recommmended by Anthony (1989) and McAllister et.al.(1989). Alternative L impacts the fewest acres of old growth habitat, thus would provide the highest amount of nesting and roosting habitat throughout the Forest.

Alternatives W (PA), D, and L provide the most potential for long-term recovery of the bald eagle. Emphasis on timber harvest, road construction, and developed recreation sites combined with minimal protection of potential territories in Alternatives NC, A, K, and J would result in lower probability that long-term recovery objectives would be achieved or maintained.

Table IV-16. Prescribed Management Level for Bald Eagle Habitat

	Alternatives						
	NC (No Change)	K	A	J	W (PA)	D	L
Habitat Acres Associated with Existing Pairs [1]	150	150	150	150	625	625	625
Acres Potential Habitat [2]	480	480	480	570	2375	2825	2825
TOTAL							

[1]These acres reflect roosting and foraging habitat known to be utilized by the existing pairs of bald eagles as well as specific nest sites.
[2]Habitat identified is around key feeding areas and potential nest sites, not formally surveyed.

Peregrine Falcon: Endangered Species - The peregrine falcon is federally listed as an endangered species. In the Pacific states, peregrine falcons nest almost exclusively on cliffs, usually near water and an abundant prey source. Although there are no known pairs of peregrine falcons on the Forest, they do nest in similar habitats on adjacent Forests. Twelve sites have been identified on the Forest as high potential nest sites by the Oregon Department of Fish and Wildlife (ODFW). They are located on rock cliffs having horizontal ledges for nesting.

The peregrine falcon is particularly sensitive to disturbance near the nest cliff during the breeding season. If human activities are occurring throughout the nesting area, the entire territory may be abandoned, and the pair may not nest (Hickey 1942, Fyfe and Olendorff 1976). Use of the organochlorine pesticides, particularly DDT, was the greatest factor contributing to the decline of the peregrine falcon (USFWS 1982).

Timber management activities can indirectly affect peregrine falcon recovery potential by impacting special and unique habitat such as meadows, hardwood stands, marshes, and bogs which often support high populations of birds used as a food resource. Timber harvest may provide additional prey populations by creating openings preferred by many of the peregrine's prey species. Silvicultural practices such as vegetation control using herbicides that reduce vegetation diversity and structure could reduce the potential population of birds within the openings. Where this occurs within a potential territory of a peregrine falcon, adverse indirect effects to recovery objectives could occur.

All of the alternatives meet the minimum habitat protection requirements of the Pacific Coast Recovery Plan for the American Peregrine Falcon. The most limiting factor for meeting recovery objectives on the Forest is the low population densities with the Pacific States recovery zone. Alternatives NC, A, and K would result in aggressive timber harvest and roading programs, with the least emphasis on maintaining habitat diversity. These alternatives would have the greatest potential to affect peregrine falcon recovery. Alternatives D, W (PA), L respectively, would place increased emphasis on maintaining vegetation and habitat diversity and would provide the highest potential to meet or exceed Recovery objectives.

Northern Spotted Owl: Ecological Indicator Species - As an ecological indicator of mature and old growth forest habitats, the northern spotted owl represents those vertebrate communities associated with late stages of forest succession. See Wildlife in Chapter III for a more detailed description of northern spotted owl habitat.

Management activities are most likely to directly impact spotted owls during the breeding and nesting seasons. Road building and timber harvest occurring between February 1 and September 30 have the highest potential for direct impacts. Noise caused by road construction machinery, skyline logging systems, blasting, and felling trees would cause significant disturbance near nest trees and natal areas (Forsman 1989, personal communication). Felling of trees may cause mortality to nestlings or fledglings not yet old enough to disperse away from the disturbance. Miller (1989) found most juvenile spotted owls stayed within natal areas an average of 104 days after fledging. Dispersal of juvenile spotted owls began in September.

Recreation activities are less likely to cause direct impacts unless high use trails and campsites are located within natal areas. Adult spotted owls have the ability to disperse from disturbance activities and have a low probability of being directly impacted. Spotted owls are relatively easy to locate and approach, making them susceptible to harassment or destruction by people.

Indirect effects of the proposed alternatives to northern spotted owls are extensive. Changes in habitat quality, quantity, and distribution would result from land allocations and management activities. Impacts to prey bases, competition and predation from species adapted to early successional or edge habitats, and fragmentation of suitable habitat will result in long-term reduction of spotted owl populations (Thomas et al. 1990). The primary land management activities causing indirect effects occur as a consequence of harvesting mature and older trees, road construction, fire, mineral development, silvicultural practices, and vegetation management. Conversion of old-growth and mature forests to managed plantations eliminates many vegetation attributes needed to support those species associated with existing mature and old growth forests. Silvicultural strategies involving maintenance of vigorous stands and harvest rotations less than 200 years have a low potential as replacement habitat in the future because of the lack of canopy layers, snags, and down logs which typically describe preferred habitat of spotted owls (USDA Forest Service, FSEIS 1989). Figure IV-17 displays the amount of mature and old-growth forests that occurred on the Forest when timber harvest began in about 1940, the current condition, and the amount remaining at the end of each future decade, by alternative. Effects of fragmentation on suitable habitat are not represented.

Past and current intensive timber management activties including timber harvest and road construction have resulted in a highly fragmented landscape. The impact this has had on the spotted owl population is unknown. Future consequences of these acivities, as represented by Alternative NC, would include a rapid decline in habitat followed by a probable decline in the spotted owl population. Concern for the future viability of the spotted owl has led to a proposal to protect the northern spotted owl under the Endangered Species Act by listing it as Threatened and Endangered throughout its range.

In compliance with the Record of Decision (1989) and Amendment to the Region 6 Guide for the northern spotted owl, suitable habitat will be provided to maintain habitat capable of supporting a viable population in Alternatives A, K, J, W (PA), D and L. All alternatives, except NC, meet or exceed MRs for the establishment of a Forest-wide spotted owl habitat network. The habitat capability for spotted owls would increase above the MR in Alternatives D and L. Protection of spotted owl habitat in Alternatives D and L would increase the number and distribution of suitable habitat islands and would reduce the risk of isolating small populations of spotted owls. Figures ***** and ***** display the estimated impact to spotted owls and their habitat by alternative.

All alternatives would provide habitat capability for 35 pairs of spotted owls in "reserved" lands such as Wilderness. Fifteen pairs have been verified as occurring in wilderness areas since 1985. An additional 60 pairs would be present within the Forest-wide SOHA network. Alternative D would provide habitat capability for 137 pairs and Alternative L would provide habitat capability for the full inventory of 219 verified pairs of spotted owls. The population of spotted owls on the Forest could continue to decline

in all alternatives. Only Alternative L provides timber harvest rotations and harvest levels which may allow the population level to stay near current densities and possibly increase over the long-term.

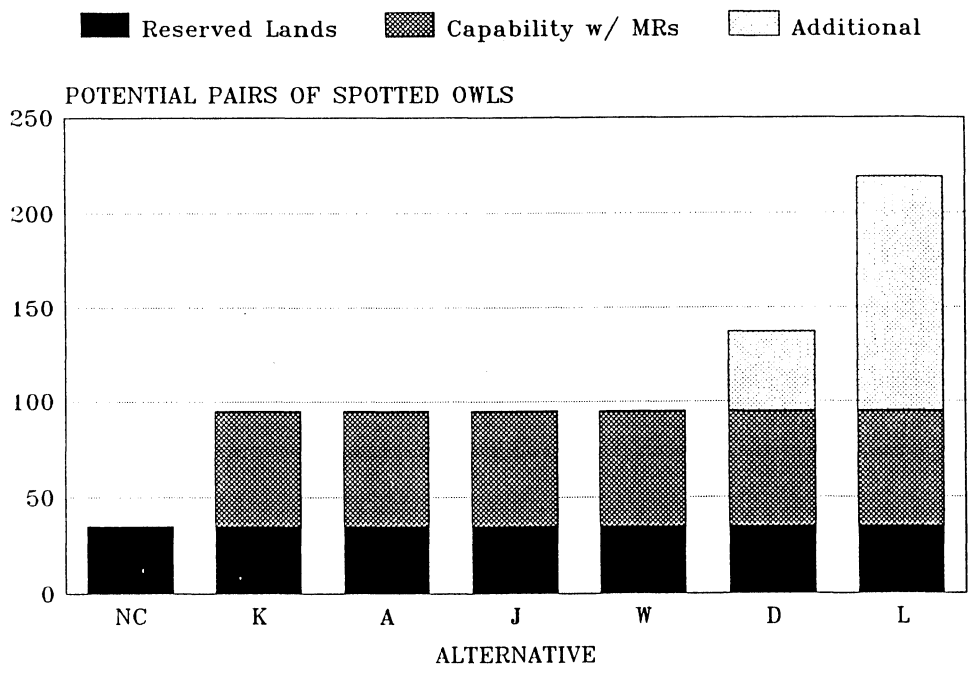
Alternatives have direct and indirect effects on spotted owls, and the species represented by them, in proportion to their emphasis on harvest of existing mature and old growth forests, road building, and other resource extraction activities. Additional impacts are caused in alternatives that minimize allocation for watershed protection, scenic values, recreation opportunities in primitive or semi-primitive settings, and retention of dead and down woody material.

All alternatives have similar potential for adverse consequences from wildfire at the current condition. Over time, the potential for severe adverse consequences would increase as fire resistant mature and old growth stands are converted to young, even aged plantations susceptible to severe fire damage. As fragmentation of fire resistant stands occurs and as stands become smaller islands within the managed landscape, the potential for direct adverse effects to spotted owls and their habitat would increase.

Prescribed fire and wildfire may adversely impact spotted owls where smoke inundation occurs in natal areas or when slash burns escape harvest unit boundaries into suitable spotted owl habitat. Alternatives that harvest the most acres of land would have a proportional increased risk of adverse consequences. Analysis of the number of wildfires reported on the Forest indicates most fires occur as a result of escaped slash burns, or other human activities assiciated with increased access resulting from timber harvest. Refer to Air Quality and Vegetation sections in Chapter IV for a more detailed discussion on causes and effects of fire.

The potential for adverse direct or indirect effects on spotted owls for all proposed Forest activities, ranked from most to least impact, would be Alternative NC, K, A, J, W (PA), D, and L, respectively.

Figure IV-8. Prescribed Management Level of Spotted Owl Pairs



	Alternatives						
	NC (No Change)	K	A	J	W (PA)	D	L
SOHA Level[1]	NA[2]	60	60	60	60	60	60
Additional Provided [3]	0	0	0	0	0	42	124
Capability in Reserved Lands[4]	35	35	35	35	35	35	35
TOTAL CAPABILITY IN PAIRS	35	95	95	95	95	137	219

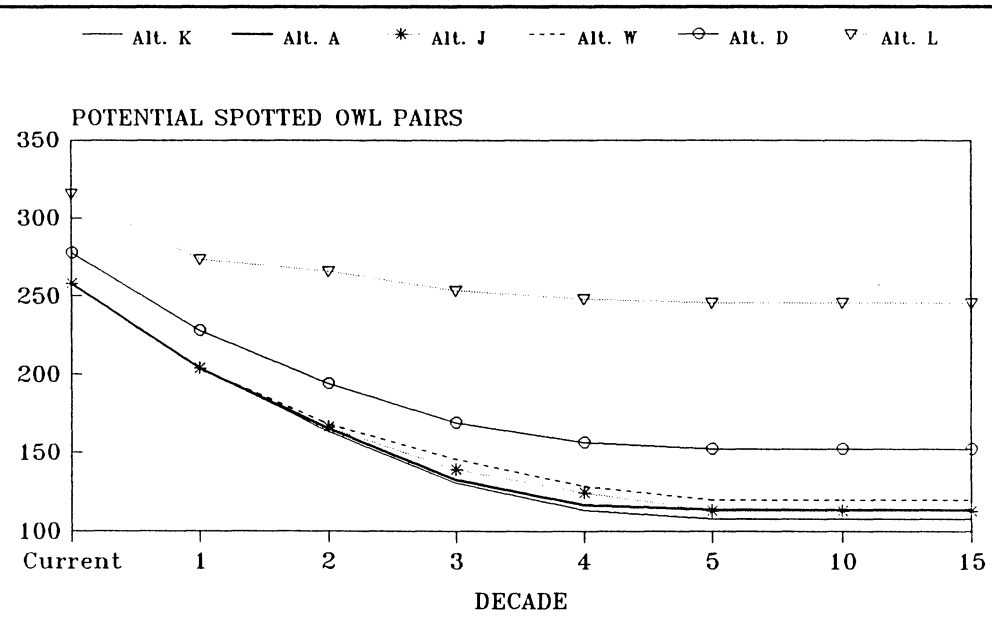
[1]Verified pairs of spotted owls located within the MR SOHA network.
[2]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. These differences are described in Chapter II of the FEIS as part of the discussion of the No Change Alternative.
[3]Verified pairs of spotted owls protected above MR levels; based on habitat capability in Alternative L and additional SOHA designation in Alternative D. Habitat may not meet management requirements for distribution.
[4] Potential pairs of spotted owls based on capability in wilderness.

Table IV-17. Mature and Old-growth Habitat

Decade	Alternatives [1]						
	NC (No Change)	K	A	J	W (PA)	D	L
1st	NA[2]	484.7	500.8	490.7	495.4	454.5	545.7
2nd	NA[2]	412.0	439.5	423.2	441.4	395.6	520.4
5th	NA[2]	267.4	307.3	299.3	327.5	285.1	485.4

[1]Acres of old-growth forest remaining at the end of each decade. Acres include Wilderness.
[2]NA Data not Available, could not be reasonably estimated or compared to the other alternatives since Alternative NC is based on a significantly different set of assumptions than the other alternatives and could not be modeled on the Willamette National Forest FORPLAN Model.

Figure IV-9. Spotted Owl Habitat Capability



	Alternatives						
Decade	**NC (No Change)**	**K**	**A**	**J**	**W (PA)**	**D**	**L**
Beginning Inventory	257.9	257.9	257.9	257.9	257.9	257.9	257.9
1st	NA[2]	203.9	203.9	203.9	203.9	227.9	273.7
2nd	NA	163.2	165.3	166.2	168.4	194.2	265.8
3rd	NA	130.4	132.6	139.1	145.8	169.1	253.5
4th	NA	113.1	116.5	124.3	128.5	156.5	248.1
5th	NA	107.8	113.9	112.7	120.0	152.4	245.6
10th	NA	107.8	113.9	112.7	120.0	152.4	245.6
15th	NA	107.8	113.9	112.7	120.0	152.4	245.6

[1]Values reflect estimates for the number of pairs that the habitat is capable of supporting.
[2]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. These differences are described in Chapter II of the FEIS as part of the discussion of the No Change Alternative.
[3]Current habitat capability is 187 pairs based on 152 pairs verified and 35 potentially suitable sites not formally surveyed.
[4]After the 5th decade, it is assumed that old-growth stands of timber will remain only in the Allocations withdrawn from timber harvest.

Pileated Woodpecker: Ecological Indicator Species - The pileated woodpecker represents those wildlife species associated with mature and old-growth forests of the true fir, true fir/Douglas fir, Douglas fir/western hemlock, and Douglas fir vegetation series. The habitat requirements are broader than those identified for the spotted owl. The size of trees available for cavity excavation determines habitat capability and is used to determine the forest vegetation series that comprise suitable pileated woodpecker habitat on the Forest. The size and number of snags used for nesting and roosting have been documented by Mannan (1982) and Mellen (1987) for the Douglas fir forests west of the Cascade Range.

Distribution of contiguous forest stands containing high numbers of large, standing, dead trees is a limiting factor for future population potential. Chapter III, Wildlife, contains a complete discussion of the MR for pileated woodpeckers.

Fire and felling of trees during breeding seasons are the primary activities likely to result in direct impacts to pileated woodpeckers. Most management activities directly impact the availability and distribution of habitat, and indirectly influence changes in populations densities.

Management activities that harvest mature and old-growth trees, increase forest fragmentation, and result in landscapes dominated by managed stands less than 100 years old would have the greatest impacts on nesting and roosting habitat of pileated woodpeckers. Forests less than 100 years old would not have developed the size, number, and distribution of snags required for viable populations of pileated woodpeckers. Some sites have a lower potential for tree growth and considerable more time could be required for development of suitable nesting and roosting habitat.

Snags, downed trees, and large green trees also serve as important sources of food for pileated woodpeckers. As unmanaged stands with these characteristics are harvested and managed on rotations of less than 100 years, pileated woodpecker habitat on the Forest would diminish. Managed stands with trees greater than 14 inches dbh and canopies 40 or more feet tall, begin to provide habitat for dispersal and foraging (Mellen 1987). Suppression of trees during forest devlopment results in some tree mortality or insect outbreaks. These occurrences provide recruitment of dead and dying trees throughout the successional development of forest stands. Trees within managed stands on this Forest could begin to provide snags of adequate size for nesting and roosting at about 120 years of age. Forest-wide, harvest rotations of at least 150 years would be required to allow recruitment of adequate numbers and sizes of snags. Use of shelterwoods while foraging has also been documented, but pileated woodpeckers show an avoidance for early seral forest stands (Bull 1989, personal communication).

Because pileated woodpeckers forage extensively on insects such as carpenter ants and insect larvae, pest management activities that reduce these insects populations or use "sanitation" techniques involving the removal of dead or dying trees adversely affects prey bases critical to insectivorous species.

Wildfire has historically created high numbers of dead and defective trees in forest landscapes. Trees killed or injured by wildfire have lower resistance to insect or fungal invasion and provide long-term recruitment of snags, down woody material, and defective tree habitat. Prescribed fire could provide a similar function in managed stands, however, current procedures and activities associated with the control, suppression, and mop-up of prescribed fire and wildfire used in slash burning or control of wildfire could result in a net decrease in snag recruitment and retention.

Salvage of hazard trees, snags, and down trees within road rights-of-way causes additional loss of habitat. The impacts of salvage associated with road maintenance and use increase as the number of miles of road maintained increases.

For all alternatives, with the exception of Alternative NC, pileated woodpecker habitat would be provided to maintain viable populations. Figure IV-10 displays the impacts to suitable pileated woodpecker habitat over time, by alternative. Alternative L would provide the highest number of habitat acres, followed by Alternatives D, W (PA), J, A, L, and NC, respectively. Alternatives L and W would provide management strategies for replacing pileated habitat acres, using extended rotations with retention of large green trees to simulate conditions found in native, unmanaged stands. Alternative D would provide the second highest habitat capability, but would not provide the dispersal corridors prescribed in Alternatives W (PA) and L. Pileated woodpeckers and their habitat would be at highest risk in Alternatives NC, A, and K, respectively.

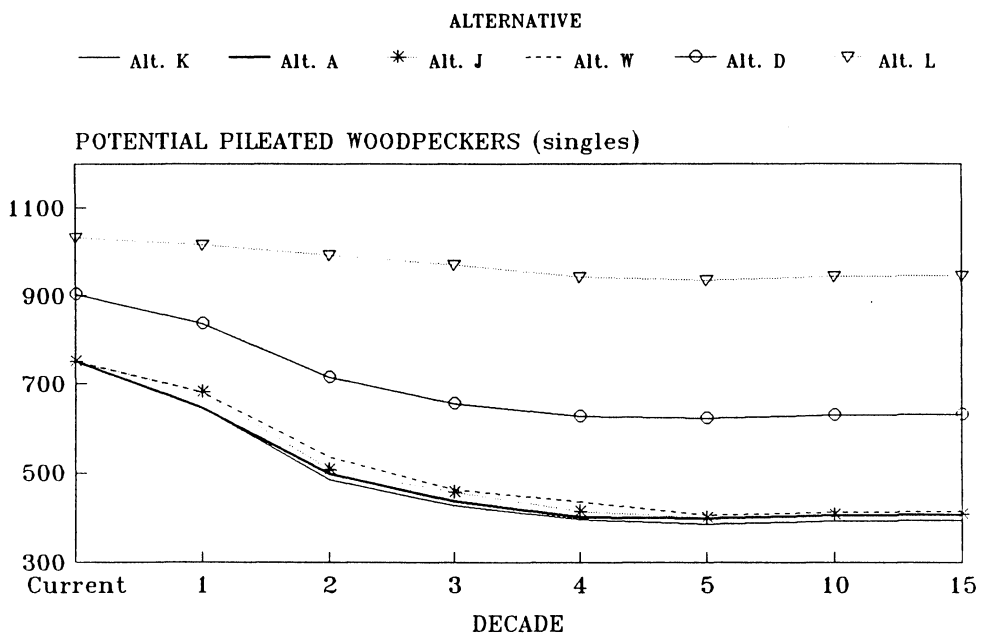
Table IV-18 displays the potential population of pileated woodpeckers on the Forest by alternative. The potential population number was derived from a combination of habitat capability provided in reserved lands, spotted owl habitat areas, pileated woodpecker habitat areas, and general forest. Each spotted owl habitat area is assumed to provide enough habitat for a pair of pileated woodpeckers. Reserved lands and general forest were evaluated to determine the amount, distribution and quality of suitable pileated woodpecker habitat. The analysis process is described in Appendix B.

Table IV-18. Prescribed Management Level of Pileated Woodpecker Habitat [1]

	Alternatives						
	NC (No Change)	K	A	J	W (PA)	D	L[2]
Pileated Woodpecker Habitat Areas	NA[3]	38	38	38	38	38	--
SOHAs[4]	NA[3]	118	118	118	118	274	355
Reserved Lands[5]	83	83	83	83	83	83	83
Total Habitat Capability	83	239	239	239	239	395	438

[1]Includes only protected mature and old-growth habitat suitable for pileated woodpeckers. Habitat capability is expressed as potential numbers of individual pileated woodpeckers.
[2] No specific allocation of pileated woodpecker habitat is needed to meet MR levels for habitat quality or distribution; capability is maintained by the existing condition.
[3]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. These differences are described in Chapter II of the FEIS as part of the discussion of the No Change Alternative.
[4]These SOHAs reflect the management requirement (MR) level for spotted owls on the Willamette National Forest.
[5]Pileated woodpecker habitat areas located in Wilderness and undeveloped roadless areas. Habitats may not meet minimum management requirements for distribution.

Figure IV-10. Pileated Woodpecker Habitat Capability [1]



	Alternatives						
y Decade	NC (No Change)	K	A	J	W (PA)	D	L
1st	NA[2]	645.2	645.2	682.1	680.7	836.9	1014.2
2nd	NA	485.0	498.8	508.1	535.6	714.9	991.7
3rd	NA	426.6	438.0	458.1	463.8	655.1	969.4
4th	NA	395.1	401.7	414.9	435.6	627.5	941.9
5th	NA	384.9	398.5	399.5	405.2	622.1	935.3
10th	NA	392.4	406.0	407.0	412.7	629.3	942.8
15th	NA	393.9	407.5	408.5	414.2	631.0	944.3

[1]Values reflect estimates for the number of individuals that the habitat is capable of supporting.
[2]NA - Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. These differences are described in Chapter II of the FEIS as part of the discussion of the No Change Alternative.

Potential population trends, projected over 15 decades, indicate that pileated woodpecker populations would remain at or above the MR level in all alternatives, but NC. These trends assume no catastrophic events result in the loss of habitat network sites. Loss of network habitat areas would increase isolation of populations. The effect this would have on viability of pileated woodpeckers is unknown. Studies of other nonmigratory, large, long lived birds indicate there may be cause for long-term viability concern with the strategy used in development of the Management Requirements for pileated woodpeckers (Thomas et.al. 1990).

Marten: Ecological Indicator Species - Marten is the management indicator species (MIS) for wildlife that utilize mature and old-growth forests of true fir, mountain hemlock, True fir/Douglas fir, Douglas-fir/hemlock, and Douglas fir vegetation series. Marten are secretive, nocturnal mammals and are not readily observed. Marten have historically been trapped for their fur. ODFW regulates the harvest of marten populations.

Marten are highly mobile, and direct effects on populations would most likely occur as a result of trapping, or loss of young during timber harvest operations.
Timber harvest, fire, and road construction have the greatest direct effect on marten habitat. These land management activities will impact habitat distribution and suitability resulting in indirect effects to population densities.

Martens utilize mature and old-growth forest types as primary habitat, but they disperse through, and hunt in, early seral stands having greater than 50% crown closure, high numbers of downed trees, and snags. Chapter III, Wildlife, contains a discussion on marten habitat and the MR for maintaining viable populations.

In Alternative NC, marten habitat may not be provided at levels needed to maintain viable populations. Habitat quality and distribution outside reserved lands (Wilderness, Research Natural Areas, etc.) would become a limiting factor. Populations would become isolated and overall population viability would decline as timber harvest and road construction fragment the landscape, reducing habitat capability.

All alternatives, except NC and L, use a combination of spotted owl, pileated woodpecker, and marten habitat areas to provide a network of well distributed mature and old-growth conifer habitat throughout the Forest. Habitat islands provided in the MR for pileated woodpecker and marten habitat areas may not be large enough to provide for breeding pairs of marten (Irwin 1987). The function of the habitat areas could be limited to provided "stepping stone" habitat for dispersing juveniles or adults seeking unoccupied territories located within larger habitat islands found in SOHAs or reserved lands. Where suitable habitat exists on lands available for timber production and is contiguous with designated habitat, habitat quality and quantity for breeding pairs would be present until those areas are fragmented or harvested.

Figure ***** displays the effect of timber harvest on the amount of suitable marten habitat available on the Forest, by alternative. Alternative L has the least effect on marten habitat because it harvests the fewest acres per decade, and provides extended rotations for recruitment of mature forest habitat. Relative impacts to marten habitat, thus population potential, listed in order of decreasing effect are Alternative NC, K, A, J, W (PA), D, and L, respectively.

Alternative W (PA) provides a well distributed habitat network with some provision which exceed the MR. The preferred alternative (W) would provide direction for maintaining 340 acres of managed stands meeting forage and dispersal requirements contiguous with 160 acres of protected mature or old-growth habitat for each habitat area. Protection of riparian corridors for dispersal and foraging, protection of special and unique habitats, and Forest-wide S&Gs for maintaining moderate to high amounts of large down material in managed stands would be emphasized. These factors increase the potential for well distributed, viable marten populations in Alternative W (PA).

Alternative D increases the number of spotted owl habitat areas. These additional sites were placed to provide larger habitat islands and increase the Forest-wide distribution of mature and old growth habitat. Marten habitat capability would be increased as as a result. Dispersal corridors are limited, and this could reduce interaction within the marten population Forest-wide.

Table IV-19 displays the projected effects to marten populations of the alternatives considered. These population estimates are based on habitat capability which includes an assessment of forest fragmentation, habitat availability within reserved and nonreserved lands, and distribution of habitats.

Table IV-19. Prescribed Management Level of Marten Habitat [1]

	Alternatives						
	NC (No Change)	K	A	J	W (PA)	D	L[2]
Marten Habitat Areas	NA[3]	100	100	100	100	100	--
Martens in PWHAs	NA[3]	38	38	38	38	38	--
Marten in SOHAs[4]	NA[3]	118	118	118	118	274	438
Marten in Reserved Lands	459	459	459	459	459	459	459
Total Habitat Capability	459	715	715	715	715	871	897

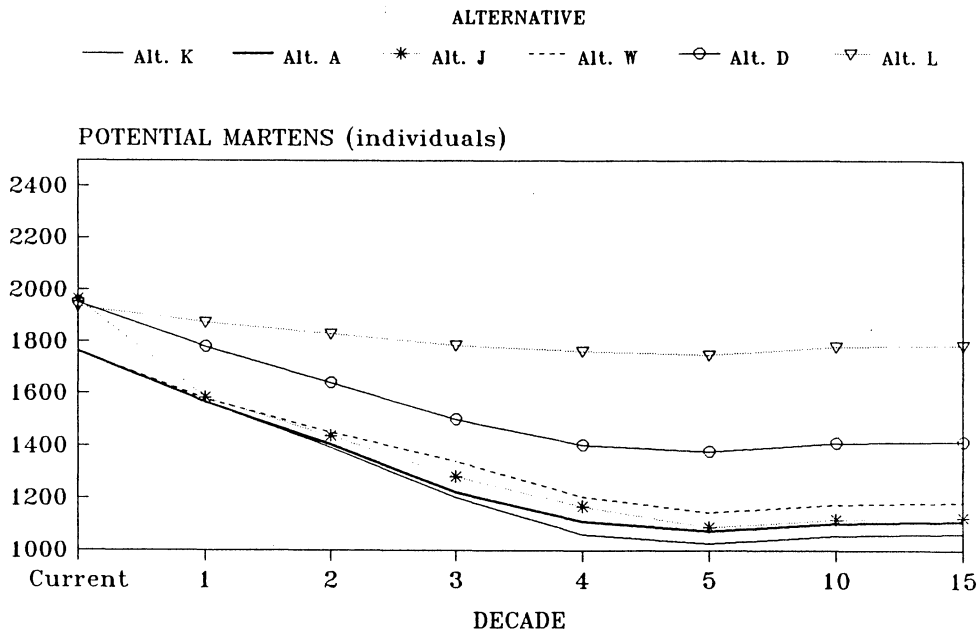
[1] Habitat capability for marten is expressed as potential population of individual martens. Includes only protected mature and old-growth habitat suitable for pine marten.
[2] No specific allocation is needed to meet MRs for habitat quality, quantity or distribution.
[3]NA = Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. These differences are described in Chapter II of the FEIS as part of the discussion of the No Change Alternative.
[4]Each SOHA provides the equivalent of two pine marten areas.

Table IV-20. Mature and Old-growth Habitat[1]

	Alternatives						
Decade	NC (No Change)	K	A	J	W (PA)	D	L
1st	NA[2]	522.4	538.5	528.4	533.4	492.2	583.4
2nd	NA[2]	449.7	477.2	460.9	479.1	433.3	558.1
3rd	NA[2]	386.5	422.4	402.1	432.6	424.2	542.0
4th	NA[2]	327.5	374.3	351.3	391.6	380.3	530.8
5th	NA[2]	305.1	345.0	337.0	365.2	322.8	523.1

[1]Acres of old-growth timber remaining at the end of each decade. Acres include Wilderness.
[2]NA Data not Available, could not be reasonably estimated or compared to the other alternatives since Alternative NC is based on a significantly different set of assumptions than the other alternatives and could not be modeled on the Willamette National Forest FORPLAN Model.

Figure IV-11. Marten Habitat Capability [1]



	Alternatives						
Decade	**NC (No Change)**	**K**	**A**	**J**	**W (PA)**	**D**	**L**
1st	NA[2]	1567.6	1567.6	1583.8	1781.4	1580.1	1873.4
2nd	NA	1392.3	1405.4	1437.0	1640.7	1450.7	1829.2
3rd	NA	1201.9	1222.4	1282.5	1500.4	1340.5	1785.0
4th	NA	1061.9	1110.8	1168.4	1402.0	1205.6	1763.1
5th	NA	1027.3	1074.2	1089.3	1378.3	1145.1	1750.0
10th	NA	1058.2	1105.0	1120.2	1409.1	1176.0	1780.8
15th	NA	1064.3	1111.1	1126.2	1415.2	1182.0	1786.9

[1]Values reflect estimates for the number of individuals that the habitat is capable of supporting.
[2]NA - Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. These differences are described in Chapter II of the FEIS as part of the discussion of the No Change Alternative.

Primary Cavity Excavators: Ecological Indicator Species - Dead and defective trees provide a unique habitat type for a diverse array of species. Associated with these decaying wood habitats are a wide variety of plants, animals and microorganisms essential to the nutrient cycling in the forest ecosystem. Maintenance of a dead and defective component in the forest provides a habitat requirement for many species that can not be filled by any other component of the forest. Loss of this component would result in a large loss in wildlife diversity.

Dead and defective trees provide essential habitat for species referred to as primary cavity excavators (PCE) and secondary cavity users. Primary cavity excavators are those wildlife species that excavate cavities for nesting and roosting. Secondary cavity users are those wildlife species that use cavities created by PCE species for their life history needs. Many insectivorous species use dead and defective

trees as foraging substrates, regardless of whether they require cavities for nesting or roosting. Chapter III, Wildlife, provides a discussion on wildlife species dependent on dead and defective trees. Potential consequences to primary cavity excavator populations are assumed to indicate potential impacts to all species dependent on dead and defective trees.

Direct effects to species requiring dead and defective trees occur primarily as result of tree harvest during reproductive seasons. Cutting of hollow trees or trees containing cavities would cause direct mortality to nesting or denning species.

Activities such as timber harvest, firewood cutting, prescribed burning, and pest management have the greatest potential for adverse impacts to dead and defective tree habitat. Direct loss of habitat caused by management activities would indirectly influence population levels.

Pest management activities that focus on control of insect populations could deplete the forage resource, or cause poisoning if toxicants are used. Recruitment of dead and defective trees is often a direct result of insect damage. Pest control activities will result in reduced availability of replacement snags. The effects of pest management activities on insectivorous species cannot be inferred from assessments of habitat availability. Individual projects would need to be evaluated for environmental consequence of the specific pest management activity.

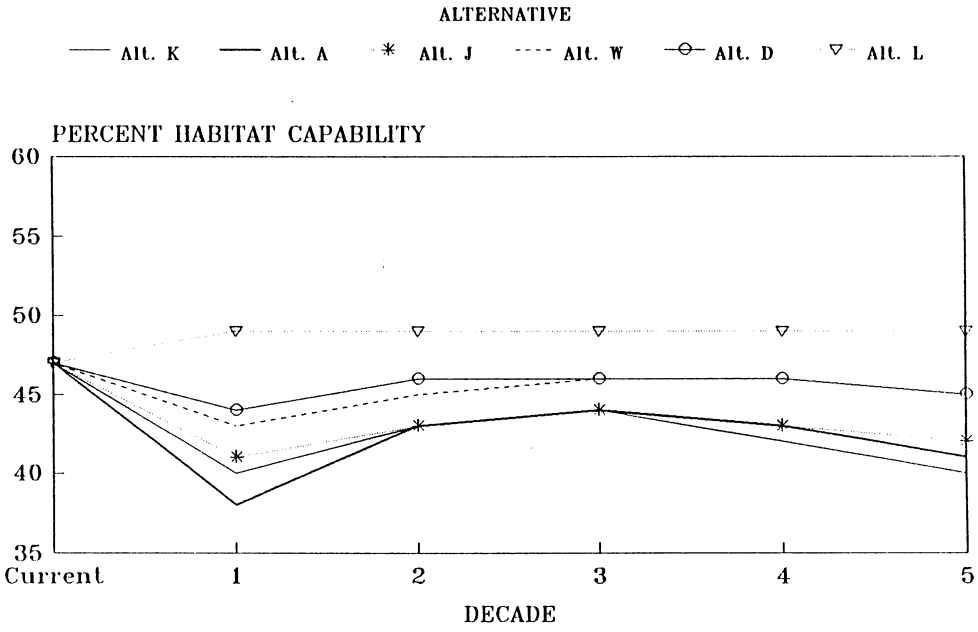
Although fire can consume snags and down logs which serve as forage and nesting habitat, it can also increase snag numbers and damage live trees, lowering their resistance to insect or fungal invasion. Of primary concern are the activities associated with the control, suppression, and mop-up of prescribed fire and wildfire. Historically, fire control resulted in the loss of high numbers of snags. This continues to be a concern in managed stands where fire is prescribed as a post harvest activity to meet specific resource objectives. Fire as a post harvest treatment has been used on most harvest acres and is proposed to be used on most harvested acres through the first decade.

The greatest impact to dead and defective tree habitat results from timber harvest. Salvage of dead and dying trees has occurred throughout most roaded subwatersheds. Salvagable dead trees are used as a component of the allowable sale quantity in all alternatives. Salvage within road rights-of-way results in an area approximately 100 feet on either side of roads being devoid of snags. Salvage activities would directly reduce the potential population of primary cavity excavators on lands available for timber production by 20% forestwide (Smith 1990). Few snags were left on areas harvested and burned in the past. This reduced potential populations of primary cavity excavators by an additional 35%. Retention of trees within harvest units has improved in recent years and would be required in all alternatives, except NC.

Some forest vegetation series may not have the biological capability to support 100% of potential populations because of the small size of trees available for cavity excavation. On this Forest, mountain hemlock stands may not achieve the 18 inch diameter required to support all species of cavity excavators identified on the Forest. Current habitat capability for potential populations of primary cavity excavators is 45%.

Alternatives NC and A have the most adverse effect on dead and defective tree habitats. Management direction in Alternatives J, K, and W (PA) provides for well distributed habitat within all harvest units, and would result in a moderate decline in habitat conditions. Retention of dead and defective tree habitat would be increased in Alternatives D and L causing the least impact to primary cavity excavator habitat.

Figure IV-12. Habitat Capability for Primary Cavity Excavators [1]



	Alternatives [1]						
Decade	**NC[2] (No Change)**	**K**	**A**	**J**	**W (PA)**	**D**	**L**
1st	NA[2]	2,435	2,340	2,542	2,639	2,696	3,001
2nd	NA	2,635	2,609	2,659	2,741	2,796	3,029
3rd	NA	2,675	2,690	2,677	2,798	2,813	2,998
4th	NA	2,604	2,664	2,622	2,803	2,832	2,992
5th	NA	2,448	2,521	2,571	2,764	2,781	3,019
10th	NA	3,563	3,696	3,850	4,116	4,103	4,551
15th	NA	3,423	3,546	3,778	4,060	4,058	4,652

[1]Values reflect estimates for the number of snags available for use by primary cavity excavators (in thousands of snags).
[2]NA - Data Not Available; could not be reasonably estimated, or compared to other Alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Willamette National Forest FORPLAN model. These differences are described in Chapter II of the FEIS as part of the discussion of the No Change Alternative.

Roosevelt Elk and Black-tailed Deer: Featured Species - Special emphasis has been placed on Roosevelt elk and black-tailed deer because of their economic and recreational importance. Recreational activities related to hunting, viewing, and photographing deer and elk result in significant contributions to local economies. Chapter II describes the projected outputs for deer and elk by alternative. A discussion on the habitat requirements for healthy, productive populations is presented in Chapter III.

Deer and elk use a wide variety of forest and non-forest vegetation types throughout the Forest. Most individuals and herds are migratory using higher elevations during summer months and lower elevations during winter. Migratory routes are often traditional with the same routes used year after year. Special and unique habitats such as meadows, marshes, bogs, and talus slopes are critical during specific times of the year.

Roosevelt elk are more sensitive to habitat changes and disturbance than deer, and therefore have more restrictive habitat needs. Thus, habitat requirements for elk are assumed to meet the requirements for deer as well. Elk were used as an indicator of habitat capability for deer in assessing the potential effects of the alternatives.

Hunting and poaching are two activities occurring on the Forest which have great direct effect on deer and elk populations. Severe winter weather with accumulations of deep snow also directly impact population levels, potentially causing significant population reductions. Large catastrophic fires cause some deer and elk mortality, but rarely result in significant population losses.

Management activities indirectly affect populations levels by directly impacting habitat suitability. The design, size, and placement of harvest units within a given landscape can be either beneficial or detrimental. Harvest of mature and old growth forests reduces cover quality, making deer and elk more susceptible to environmental extremes in summer and winter (Brown 1985). Timber harvest provides openings and edge habitats preferred by deer and elk for foraging. Alternatives NC, K, and A have the most potential to adversely affect cover quality Forest-wide because of high timber harvest levels and reduced emphasis on protection of optimal cover. Increasing emphasis would be placed on providing optimal cover (mature and old growth forest stands) in Alternatives J, W (PA), and D by protecting optimal cover on winter ranges, and protection of mature and old growth stands for other resource values including visuals, dispersed recreation, special interest areas, old-growth groves, special wildlife habitats, and riparian areas. Alternative L provides the the most acres of optimal cover, however distribution of forage openings would limit overall capability to produce deer and elk.

Presence of roads can have adverse effects on deer and elk. Open roads reduce the use of openings by deer and elk, increase potential for harassment and poaching, and reduce escapement of mature bulls during hunting seasons. Alternatives that harvest the highest number of acres have the most potential for adverse effects due to development and use of open roads. Specific habitat enhancement measures such as access management, gates and barriers, and vegetation retention can be implemented to mitigate road system development. Additional mitigation measures are described in the section of Chapter IV titled Mitigation Measures for Wildlife. Alternative D provides the highest emphasis on reducing the effects of roads followed by Alternatives L, W (PA), J, K, A, and NC respectively.

Fire affects deer and elk habitat by creating openings and influencing the vegetative species available for forage. Sprouting and growing vegetation in burned areas often has increased forage quality. Prescribed fire and wildfire create a high quality seed bed for the establishment of preferred forage species. In some cases, noxious weed species invade burned areas and result in a net decrease in the availability of forage (Smith 1979). All alternatives provide the same level of wildfire suppression. Prescribed fire is used in all alternatives and would result in similar effects on forage quality in harvest units (Wisdom et al 1986).

Recreation use in some areas would reduce the habitat quality for deer and elk. Hunted populations of elk are sensitive to the presence of people. Campsites and trails near or through meadows and marshes could adversely affect deer and elk use of these critical fawning, calving, and foraging areas. All alternatives have potential to impact elk and deer use of areas, however, Alternatives NC, A, K, and J provide few primitive or semi-primitive recreation opportunities outside of wilderness. This would increase the potential for impacts from high recreation use where special protected habitats occur. Alternative L, D, and W (PA), respectively, provide high to moderate opportunities for spreading recreation use Forest-wide.

Winter recreation has the potential to significantly impact deer and elk on winter ranges. Energy balances are critical during the winter period. Harassment of deer and elk by skiers, snowmobilers,

campers, and hikers can cause disturbed animals to burn energy reserves that they may not be able to replace, depending on environmental conditions and the quality of habitat on the winter range. The consequence of high energy loss could result in population reductions through death, reduce birth rates, and poor survival of young the following spring. Alternative D provides the most habitat emphasis on protecting deer and elk winter range areas, followed by Alternatives L, W (PA), J, A, K,and NC, respectively.

Silvicultural and vegetation management practices influence the quality of deer and elk habitat. Reforestation and stocking control allow rapid recruitment of hiding cover (20 years) and thermal cover (40 years) following timber harvest. The long-term development of optimal cover is a function of time and would require estimated rotation lengths of 170 years or more. Precommercial thinning and vegetation management, involving cutting of brush, usually result in large accumulations of debris, leaving the treated area unsuitable for several years after treatment. In some plant community types, vegetative management activities that open the canopy by cutting brush improve forage availability by inducing basal sprouting. This practice has been used successfully on the Forest.

Vegetation management activities using herbicides are of special concern. Plants most preferred by deer and elk are most susceptible to being eliminated from treated stands. Elimination of preferred forage resources would increase the potential for severe damage to crop trees. Some concern exists as to the toxic nature of various herbicides. Little evidence exists as to toxic levels for deer and elk, however some toxic compounds are known to be stored in the internal organs and fat tissues. The Region 6 FEIS for Managing Competing and Unwanted Vegetation (1988) includes a discussion on the potential health hazards of using pesticdes.

All alternatives use intensive management techniques on all lands available for timber production. Potential for adverse effects from silvicultural and vegetation management activities would increase as the number of acres intensively managed for timber production increases. Potential for adverse effects to deer and elk also exist if too few acres are harvested and managed. Alternatives NC, K, and A have a high potential for adverse effects. Alternatives J and W have a potential for adverse effects, but like Alternative D, provide significant opportunities to use silvicultural and vegetation management techniques to develop high quality deer and elk habitat. Alternative L could have adverse effects on deer and elk as harvest levels are reduced and forage producing openings become limited Forest-wide.

Cumulative Effects of the Alternatives on Wildlife and Wildlife Habitat

Diversity of Vertebrate Species - Protection of special and unique habitats reduces the risk of adverse cumulative effects to those wildlife populations whose life history needs are not fully covered by Management Requirements. Alternatives listed in order of increasing risk of adverse cumulative effects to diversity are L, D, W (PA), J, A, K, and NC.

Alternatives W (PA) and L provide full protection of riparian ecosystems emphasizing the value of wildlife habitat in riparian corridors for foraging, nesting, denning, dispersal, and long-term connectivity between habitat islands.

Alternatives NC, K, and A would cause significant declines in habitat diversity by the fifth decade. Managed stands dominated by a few conifer species would dominate the forest landscape, resulting in isolation of protected habitat types and populations within three decades. Alternatives NC, A, K, and J result in high risk to special and unique habitats when they occur within or adjacent to stands suited for timber production.

Northern Bald Eagle: Threatened Species - Alternatives NC, A, K, and J have the greatest potential for adverse cumulative impact on habitat quality within 1.1 miles of major water bodies identified as potential bald eagle nesting, roosting, and foraging habitat. Protection of 40 acres for potential nest sites, while harvesting all other potential habitat reduces the probability that new territories would be established in the Recovery Zones. These alternatives would have the lowest potential for meeting recovery objectives and maintaining bald eagle nesting and roosting habitat in the long-term.

Alternative L and W (PA) would provide for the replacement of old-growth habitat over time in some Management Areas, thus loss of existing or potential nest sites through catastrophic events such as wildfire or windthrow would not limit long-term recovery potential.

All alternatives encourage developed recreation sites along the lakes, reservoirs, and rivers, creating significant potential for disturbance to existing territories and could preclude establishment of new territories along some designated water bodies. Only occupied territories which receive additional consideration due to site specific Bald Eagle Management Plans have a high probability for long-term viability. Mitigation Measures (Chapter IV) include conducting biological evaluation on all activities which would effect bald eagles. These measures are intended to minimize the adverse consequences associated with developed recreation sites.

Alternatives W (PA), D, and L would reduce the overall emphasis on roading and timber harvest,and would increase the protection of potential bald eagle territories. These alternatives would provide the highest potential to meet or exceed Recovery Plan objectives over the planning period.

American Peregrine Falcon: Endangered Species - Cumulative effects to peregrine falcons result as a consequences of changes in habitat conditions for prey species or impacts to the structure or microhabitat of nest cliffs. Because peregrine falcons feed extensively on songbirds, management activities that reduce habitat diversity or involve the use of toxicants have some probability of adverse cumulative impacts to recovery of the species.

Alternatives that reduce habitat diversity by converting the landscape to intensively managed conifer plantations with little structural or plant diversity, would have long-term negative indirect cumulative impacts. Peregrine falcons that would nest on the available cliffs may not have access to abundant bird populations required to sustain a viable population. Alternatives W (PA), D, and L, respectively, would have the highest probability of providing the habitat diversity and protection needed for recovery of peregrine falcon populations.

Alternatives NC, A, K, and J will create an abundance of openings that would provide foraging habitat as harvest levels remain high. Low emphasis on providing vegetative diversity within intensively managed stands, limited protection of special and unique habitats, and a landscape subjected to numerous intensive silvicultural treatments reduces the probability of providing the diversity of habitats or abundant bird populations needed to meet and exceed long-term recovery objectives for peregrine falcons.

Northern Spotted Owl: Ecological Indicator Species - Suitable spotted owl habitat will be restricted to reserved lands, lands unsuited for timber production, and lands subject to constrained harvest rates, by the fifth decade in all alternatives except L. Reduced rates of harvest occur in visual corridors and dispersed recreation management areas, 5% to 10% per decade. Spotted owls inhabiting these islands of suitable habitat will be at increased risk of eventually becoming isolated pairs or individuals. Alternative W provides a strategy to reduce habitat fragmentation, but harvest rates would eventually result in the same cumulative effect. Alternatives A, K, J, and W (PA) vary only in the rate at which direct loss of habitat results in declining populations. Alternatives W (PA), D, and L, respectively, would maintain increased potential for maintaining habitat capability above MRs through the fifth decade.

Dispersal of spotted owls through fragmented landscapes and across large expanses of unsuited habitat will increase the risk of mortality, as individuals attempt to locate unoccupied habitat islands. Fewer suitable acres of habitat Forest-wide, and limited distribution of habitats needed for nesting, feeding, and roosting, could result in increased adult mortality rates and decreasing juvenile survival. Dispersal opportunity would be highest in Alternative L and Alternative W (PA). Alternative L maintains high levels of suitable habitat Forest-wide. The preferred alternative (W) places management emphasis on riparian resources, visual corridors, and retaining many of the vegetation attributes of existing unmanaged stands (residual green trees, snags, and down logs) in managed stands. These strategies provide increased dispersal opportunity.

The potential for severe adverse consequences from escaped slash burns or wildfire increases over time. Landscapes dominated by young, even aged stands with inclusions of mature or old growth islands will be more susceptible to crown fires and catastrophic loss of suitable habitat islands. Increased amounts of small dead and downed woody debris left untreated in harvest units increases the potential for fire ignition within individual managed stands during the decade following harvest. Large down woody material maintains a high moisture content and will not necessarily increase the risk of wildfire.

The potential to replace of network habitat areas following catastrophic events would be very limited in Alternatives NC, A, J, K, and W (PA) by the third decade. Alternatives D and L provide protection above the MR level, and would provide some opportunity to replace lost habitat.

Pileated Woodpecker: Ecological Indicator Species - Based on habitat capability assessments, potential populations of pileated woodpeckers would decline in all of the alternatives, except L. Most habitat loss will occur during the first five decades. After the fifth decade only those lands allocated to no harvest, or rotations longer than 150 years, would contain suitable roosting or nesting habitat. Alternative D provides the second highest long-term capability, but dispersal between habitat islands could result in a high juvenile mortality rate. Alternative W (PA) provides travel and distribution corridors with a high degree of structural diversity. Potential for successful dispersal between habitat islands would be highest in Alternatives L and W (PA), respectively.

Only Alternative L provides for significant recruitment of suitable mature and old growth habitat in the future. All other alternatives intensively manage most lands suitable for timber harvest on rotations less than 120 years. Although much of the landscape should be suited for dispersal and foraging (age classes greater than 50 years) there is no allowance for replacement stands of suitable nesting habitat in the event of catastrophic event in the habitat islands provided for spotted owls and pileated woodpeckers.

Marten: Ecological Indicator Species - The long-term cumulative effects of the alternatives on the Forest's capability to support a viable population of marten is displayed in Figure IV-11. The rate of decline of the potential population following habitat loss is unknown. The cumulative effects assessment assumed a one decade lag between loss of habitat and subsequent decline in population. This assumption was used because of the likelihood that adult marten would survive in marginal habitat, however, recruitment to the population would be lost as habitat suitable for reproduction diminishes.

Connectivity and distribution of habitat on lands available for timber harvest would not be maintained after the third decade in any alternative but L. The Forest has evaluated the time over which options for minimizing habitat fragmentation can be maintained in Alternative W (PA). After the third decade all planned harvest would have to come from forest stands that were protected in the previous decades. Habitat suitable for dispersal of marten would diminish in all alternatives except L and W (PA). Dispersal capability in Alternative L results from low harvest levels. Alternative W provides habitat features of

snags and downed logs Forest-wide at levels capable of providing replacement habitat dispersal and foraging.

After Decade 5, mature and old-growth forest stands would be found primarily on lands unsuited for timber production in all alternatives, except L. These areas include reserved lands, spotted owl, pileated woodpecker and marten habitat areas, special and unique habitats, special interest areas, forested stands on unsuited soils, roadless lands, wild and scenic river corridors, and riparian areas. The number of acres in these allocations varies by alternative, but the rate of harvest applied to the lands suitable and available for timber production would have the same cumulative effect within five decades. Little opportunity would exist to replace habitat lost as a result of catastrophic events.

Potential population trends, projected over 15 decades, indicate that marten populations would remain viable, and suitable habitat would be provided at or above the MR level, in all alternatives, but NC. These trends assume no catastrophic events result in loss of habitat network sites required to maintain suitable habitat distribution and population capability. Loss of these areas would increase isolation of populations. The effect this would have on the viability of marten is unknown.

Primary Cavity Excavators: Ecological Indicator Species - Figure IV-12 displays the cumulative effects of timber harvest on potential populations of cavity excavating species. All alternatives cause a continued decline in distribution, quality, quantity, and recruitment of dead and defective tree habitat. Alternatives D and L provide the highest long-term habitat capability; unit and subwatershed objectives would provide habitat objectives for 60% of potential populations. Alternatives NC and A cause habitat conditions to decline to threshold levels for minimum viability. Habitat capability also decline in Alternatives J, K, and W (PA), but should stabilize near levels capable of supporting 40% potential populations.

Roosevelt Elk and Black-tailed Deer: Featured Species - Management prescriptions for high, moderate, and low habitat emphasis are common to all alternatives. The alternatives vary as to the amount of Forest area managed at each of the three emphasis levels.

Some areas designated for high emphasis would not achieve the habitat effectiveness standards within the first decade. Conversely, areas that are currently above the Forest-wide standards set for low emphasis may not decline to those levels. The current condition of the Forest most closely resembles the Forest-wide standards set for moderate emphasis. The cumulative effects of the proposed management practices would result in an overall decline in habitat capability in Alternatives NC and K. Alternatives A, J, W (PA), L, and D, respectively, provide for increasing habitat capability over time.

The effects of the alternatives, with the exception of Alternative NC, on potential deer and elk populations are evaluated using a population index which is linked with the habitat effectiveness variables described in Chapter III, Wildlife. The habitat effectiveness variables are cover quality, forage quality, open road density, and size and distribution of cover and forage. Cumulative effects are expressed in terms of potential populations of deer and elk when the habitat conditions for one of three levels of habitat emphasis are met.

Cumulative effects on potential populations were calculated based on the number of winter range acres managed at each emphasis levels. High emphasis winter range contributes habitat capability for potential populations of 2 elk and 10 deer per 100 acres. Moderate emphasis winter range contributes habitat capability for potential populations of .8 elk and 4 deer per 100 acres. Low emphasis winter range contributes habitat capability for a potential population of .1 elk and .5 deer per 100 acres. A full description of this modeling process can be found in Appendix B.

Mitigation Measures for Wildlife

Mitigation measures that reduce the effects of disturbing activities to wildlife and their habitats include Forest-wide Standards and Guidelines (S&Gs) for wildlife, prescriptions, operational practices applied during project planning and/or implementation and post-project activities designed to accelerate restoration of desired habitat conditions or attributes. The following discussion of MRs applies to all alternatives with the exception of Alternative NC.

Bald Eagle -- Management Area S&Gs consistant with Recovery Plans objectives reduce the potential for adverse impacts to bald eagles and their habitat. Forest-wide require biological evaluation of proposed activities within potential bald eagle habitat. Mitigation includes establishing protection zones around nest sites, seasonal restrictions to reduce human disturbance during critical times such as breeding, nesting, and fledgling periods, and reducing or eliminating conflicting activities in and around forage areas.

Peregrine Falcon -- Forest-wide S&Gs reduce the potential for adverse impacts to peregrine falcons. Direction includes the protection of potential nest sites, protection of special and unique habitats, and biological evaluation of activities which may affect peregrine falcon habitat.

Spotted Owl -- Standards and Guidelines established in Amendment to the Pacific Northwest Regional Guide were followed to ensure appropriate size and distribution of spotted owl habitat areas (SOHAs) throughout the Forest. All SOHA acres were removed from lands suited for timber production. No harvest will be allowed within the SOHA boundaries. Additional protection is provided for pairs of spotted owls located outside SOHAs through the use of Forest-wide S&Gs.

Pileated Woodpecker -- Management requirements for pileated woodpecker habitat are met by establishing Management Area direction. This direction is provided in the S&Gs specific to the management area.

Marten -- Management requirements for marten are met by establishing Management Areas direction. This direction is provided in the S&Gs specific to the management area.

Primary Cavity Excavators -- Forest-wide S&Gs incorporate management requirements that will provide sufficient number, distribution, and size of dead and defective trees to maintain habitat for snag dependent species capable of supporting 40% of potential populations within each subwatershed.

Deer and Elk -- Habitat management focuses on cover quality, forage quality, security, and size and distribution of cover and forage. Management emphasis varies depending on the alternative. Direction for meeting habitat effectiveness values within emphasis areas is provided through Forest-wide S&Gs.

Monitoring questions have been prepared to evaluate the implemantation and effectiveness of the S&Gs. Validation monitoring has been proposed to address the assumptions used to predict effects to habitat and populations.

Information needs have been documented to address the need for inventories and research pertaining to specific plants, wildlife, and habitats.

Relationships with Other Agency Plans or Policies for Wildlife

Management for peregrine falcons will be in accordance with the Pacific Recovery Plan for the American Peregrine Falcon (1982) and the Endangered Species Act of 1973, as amended. In a cooperative effort

with the ODFW, 12 potential peregrine nest sites were identified. If presence of a nesting pair is verified, the Forest will proceed to develop site specific management plans for the area in cooperation with the USDI Fish and Wildlife Service and Oregon Department of Fish and Wildlife.

Management of bald eagles and their habitat will be in accordance with the Pacific States Bald Eagle Recovery Plan. Additional requirements for management of occupied territories will be based site specific management plans developed in cooperation with the U.S. Fish and Wildlife Service and Oregon Department of Fish and Wildlife.

Under all alternatives habitat for the spotted owl will be provided on Federal lands adjacent to the Forest. The Mt. Hood, Umpqua, and the Deschutes National Forests along with the Salem and Eugene BLM Districts will provide habitat linkages. The private lands adjacent to the Forest have been heavily harvested and will provide little to no spotted owl habitat within the planning horizon. The contribution of spotted owl habitat on private lands within and adjacent to the Forest is expected to be minimal as old-growth stand characteristics will not be achieved on planned harvest rotations.

Under all alternatives, with the exception of Alternative NC, a systematically spaced distribution of marten and pileated woodpecker habitat will be provided on the Forest in coordination with adjacent Forests to ensure proper distribution of habitat. Private lands within and adjacent to the Forest have been heavily harvested and are expected to provide little to no marten or pileated woodpecker habitat within the planning period.

Region Six policy directs management of Primary Cavity Excavator Habitat to exceed 40% biological potential (FSM 2600). ODFW recommends 60% biological potential as the appropriate management level for primary cavity excavators. All alternatives, except NC and A, meet the Region 6 objectives, with Alternatives D and L meeting the 60% objective. Potential populations were not determined for Alternative NC.

Both the ODFW and the Forest are currently involved in a cooperative agreement to determine elk population trends, herd composition, and habitat use through an elk collaring and monitoring program. Alernatives were designed to evaluate the potential for meeting ODFW population benchmarks for deer and elk.

Incomplete or Unavailable Information on Wildlife

Territory size and habitat use of pileated woodpeckers and marten within the Cascades Province of Oregon.

Dispersal distances between habitat areas required to ensure long-term population viability for all Management Indicator Species.

Inventories of Sensitive species populations throughout the Forest.

Availability, distribution, recruitment, and fall down rates of dead and down trees in managed and unmanaged forest stands.

Biological role of old-growth Douglas fir forests in the winter survival of deer and elk populations.

Quality and amount of forage produced in seral stages of plant community development with and without treatment with prescribed fire.

Environmental Consequences Of The Alternatives On Recreation

Recreational settings occur throughout the Forest and provide a range of recreation opportunities. Changes in the characteristics of these settings affect the recreational experience of the Forest visitor. Recreation settings for both developed and dispersed use are affected by a number of management activities including those that alter plant and wildlife habitat, remove vegetation, expose soil, alter landforms, change water levels, and increase or decrease access to the National Forest land.

Numerous dispersed recreational settings are located throughout the Forest, from the densely forested areas of the Western Cascades to the meadows and alpine lakes of the Cascade Crest. Over 1,286,000 acres provide a broad range of potential dispersed recreation opportunities, in addition to those available in Wilderness. Dispersed recreation users are attracted to the Forest because of road and trail access, the presence of fish and wildlife, the scenic quality of the landscape, and its diversity of recreation settings.

People are drawn to the developed recreation sites in the Forest for many of the same reasons, including accessibility, availability of facilities, proximity to water, and attractiveness of their surroundings. Developed sites range from ski areas where facilities are provided to enhance recreational experiences and user comfort, to developed primitive campsites where facilities are provided only for the protection of basic resources. Although developed sites are relatively small, distinctly defined areas where facilities are provided for concentrated public use, the characteristics of adjacent areas also contribute to the quality of a developed recreation setting.

Direct and Indirect Effects of the Alternatives on Recreation

The management areas proposed by the alternatives will determine the location and type of recreational settings that will be available in the future. The proposed alternatives will affect recreation settings, trails, and the level of use of both dispersed and developed recreation opportunities. This will affect the capability of the Forest to meet present and projected demand for various types of recreation experiences. Alternative levels of recreation program funding also have an impact on the quantity, quality, and utility of recreational settings, especially as related to changes in the Recreation Opportunity Spectrum (ROS) inventory acres and resultant use capacity of the Forest. The capacity of recreational settings to sustain projected levels of demand is measured in Recreation Visitor Days (RVDs).

Dispersed Recreation Settings - Settings for dispersed recreation are primarily affected by activities that alter the physical character of the landscape, such as road construction, timber harvest, and mineral and energy development. The extent to or manner in which the landscape is altered will affect each ROS setting differently.

Semiprimitive settings, both motorized and nonmotorized, are affected to the greatest extent by landscape altering activities. In the roaded natural and roaded modified setting, road construction and timber harvest are normal occurrences; however, setting activities are designed to ensure a specified level of scenic quality and recreation experience. Although semiprimitive motorized and nonmotorized settings can absorb small, carefully designed alterations, activities typically associated with roaded natural and roaded modified settings would preclude satisfaction of user needs for isolation, solitude, and primitive type recreation in these settings. In addition the influences of road construction and timber harvest activities in near proximity to semiprimitive settings can reduce the effective size of these settings. Also the presence of noise and the visibility of timber harvest operations detract from and thus can further diminish this experience opportunity.

The effect on settings for dispersed recreation is illustrated by the disposition of each ROS class setting in the alternatives. Depending on which management areas are applied in the alternatives, all or part of a given ROS Class may be managed for an opportunity that is different than its inventoried potential. Table IV-21 displays how each inventoried ROS setting would be managed by alternative.

Table IV-21. Effects on Inventoried Dispersed Recreation Opportunity Settings

ROS Inventory			Alternatives [1]						
Classes	Acres	Proposed Management	NC	K	A	J	W	D	L
Semiprimitive Nonmotorized (SPN)	205,335	SPN	26	4	25	30	29	62	61
	SPM	4	14	4	5	6	8	2	
		RN	11	18	21	23	24	17	36
		RM	59	64	50	42	41	13	1
		Total	100	100	100	100	100	100	100
Semiprimitive Motorized (SPM)	43,300	SPN	24	0	21	35	34	65	74
	SPM	15	23	14	16	17	9	1	
		RN	10	29	24	17	20	11	24
		RM	51	48	41	32	29	15	1
		Total	100	100	100	100	100	100	100
Roaded Natural (RN)	437,615	SPN	1	0	1	2	1	3	12
	SPM	1	1	1	2	3	3	7	
		RN	27	36	39	48	50	65	68
		RM	71	63	59	48	46	29	13
		Total	100	100	100	100	100	100	100
Roaded Modified (RM)	600,120	SPN	0	0	0	0	1	1	11
		SPM	1	1	1	1	1	1	5
		RN	3	11	12	15	17	18	58
		RM	96	88	87	84	82	80	26
		Total	100	100	100	100	100	100	100

[1] Values are percent of inventoried non-Wilderness ROS acres.

Semiprimitive Non-motorized - Alternative K has the greatest effect on semiprimitive nonmotorized (SPN) recreation settings. In this alternative 82% of the SPN is proposed for management as roaded natural (RN) and roaded modified (RM) opportunities. The SPN settings managed for RN and RM opportunities will, in 5 to 10 years, be altered dramatically by roads and harvest units, and thus unable to provide for user needs of isolation, solitude, and primitive type recreation in an un-modified natural environment. Alternatives D and L maintain 61% and 62% respectively the Forests inventoried SPN settings.

Semiprimitive Motorized - Of all the alternatives, D and L have the most favorable effect on semiprimitive motorized (SPM) recreation settings, maintaining 61% and 75% respectively. Alternatives D and L, through management area allocations that provide both motorized and nonmotorized use in undeveloped areas, also maintain 74% and 75% of inventoried SPN settings, respectively. Alternatives NC, K, and A propose management of between 61% and 77% of the Forest's semiprimitive motorized recreation setting for roaded natural and roaded modified opportunities; while this change from unroaded

opportunities to roaded recreation does not preclude motorized use, it does limit dramatically off-road vehicle use opportunities in undeveloped settings.

Roaded Natural - Inventoried roaded natural settings are affected most adversely in Alternatives NC, K and A as between 59% and 71% of this opportunity setting is proposed to be managed as a roaded modified setting. The frequency and design characteristics of management activities in the roaded modified setting will result in an obviously altered, rather than a natural appearing landscape, typical of the roaded natural setting. Alternatives D and L would have the most favorable effect on the roaded natural setting as they maintain 65% and 68% respectively, of the Forest's inventoried potential.

Roaded Modified - Opportunities for recreation use in a roaded modified setting are maintained to a significant extent of inventoried potential (80%-96%) in all alternatives except, Alternative L. Minor amounts of this inventoried opportunity setting are proposed for management as roaded natural and semiprimitive settings. Alternative L proposes that 74% of the RM setting would be managed as RN, SPM and SPN settings.

Oregon Cascades Recreation Area (OCRA) - The OCRA is a unique recreation setting within the Forest that provides semiprimitive recreation opportunities. The OCRA was established by the Oregon Wilderness Act of 1984 to conserve and protect a wide array of natural resources and landscape attributes, and provide for use of both developed and dispersed recreation settings including motorized access and use opportunities. The portion of the OCRA managed by the Forest encompasses the Timpanogas Basin, located 45 miles southeast of Oakridge, Oregon.

While the alternatives have no effect on the location of boundaries, or the size of the OCRA, they do effect how the area is proposed to be managed. Effects on the environment of the area are expected to be minor as no programmed timber harvest or road construction is permitted. Effects to the physical resource are anticipated primarily from human use, such as soil displacement, compaction of camp areas, trampling of ground cover vegetation, and increased littering. The degree of effect on the resources would vary among the alternatives. Alternatives that permit motorized use of the area will have a greater effect on the recreation setting of the OCRA than those that exclude such use. Table IV-22 displays OCRA proposals for managing motorized and nonmotorized use in each alternative.

Alternatives K and L are expected to have the least effect on the physical resources of the OCRA as motorized use is excluded from the area, except in winter under Alternative K. The greatest potential effect to the area's resources is expected from Alternatives NC and A as motorized use is permitted throughout the OCRA. Effects of Alternatives J, W (PA) and D are expected to occur primarily in motorized trail zones and dispersed camping areas.

Dispersed Recreation Use and Demand - Dispersed recreation use Forest-wide currently totals 1,480,900 recreation visitor days (RVDs). User demand for this form of recreation use is expected to increase to 3,980,600 RVDs by the year 2040. The Forest's inventoried capacity to accommodate future use exceeds expected use levels in 2040 by 21%. Although total use in dispersed recreation activities may not be particularly sensitive to changes in management allocations, use that is dependent on a specific recreation setting would,however, be affected by such changes in the alternatives.

RVD outputs for the NC Alternative are not available for comparison on an ROS class basis. However, outputs for total dispersed recreation use for the NC Alternative are shown and compared with other alternatives in the Resource Program section of Chapter II.

Table IV-22 Management Options for Motor and Nonmotor Use of the OCRA [1]

	Alternatives						
	NC	K	A	J	W	D	L
UNDEVELOPED AREAS							
All Seasons	M/N	N/S	M/N	N/S	N/S	N/S	N
TRAIL ZONES [2]	M/N	N/S	M/N	M/N	M/N	M/N	N
All Seasons							

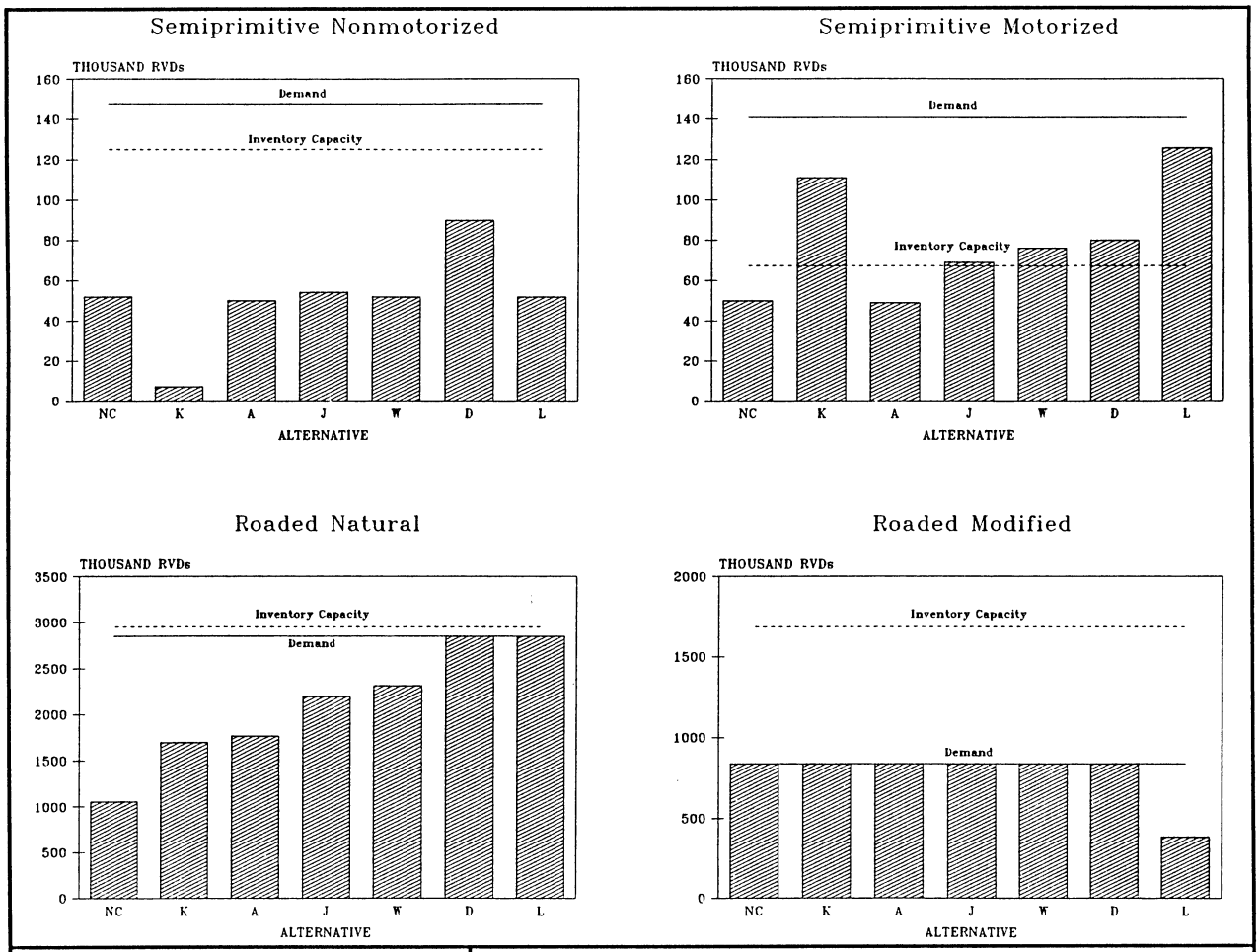
[1]M/N = Motorized and Nonmotorized use.
N = Nonmotorized use.
N/S = Nonmotorized use with winter only motorized use.
[2] The Pacific Crest National Scenic Trail is closed to motorized use all year.

Because of the changes to settings for dispersed recreation described above and illustrated in Table IV-21, the Forest's ability to satisfy user demand for semiprimitive and roaded natural settings is limited in some alternatives. However, future demand for roaded modified opportunities is fully satisfied in all alternatives. Figure IV-13 illustrates the extent to which each alternative would satisfy user demand for each ROS setting.

The public's desire for use in semiprimitive nonmotorized recreation settings is best provided for in Alternative D. This alternative proposes to supply 61% of expected user demand in the year 2040. Alternative K has the greatest effect on supplying semiprimitive nonmotorized use opportunities by accommodating 6% of the demand expected in the year 2040. Other alternatives supply between 34% and 35% of future demand.

User demand for semiprimitive motorized recreation opportunities is provided for to the greatest extent in Alternatives K and L. Alternative L supplies 89% of demand while Alternative K provides 79% of 2040 demand. Alternatives J, W (PA) and D provide between 50% and 57% of use expected in the fifth decade (2040). Other alternatives provide between 34% and 35% of 2040 demand.

Figure IV-13 Effects on Dispersed Recreation Use [1]



			Alternatives [1]						
ROS CLASSES	**2040 RVD**	**Demand[2]**	**NC[3]**	**K**	**A**	**J**	**W**	**D**	**L**
Semiprimitive Nonmotorized	Demand	147.8	35	5	34	37	35	61	35
Semiprimitive Motorized	Demand	140.9	36	79	35	50	54	57	89
Roaded Natural	Demand	2,852.7	37	59	62	77	81	100	100
Roaded Modified	Demand	839.2	100	100	100	100	100	100	100

[1] Alternative outputs are percent of 5th decade RVD demand provided.
[2] Values are in thousands of RVDs.

The Forest's ability to satisfy demand for semiprimitive motorized and nonmotorized use in any of the alternatives is limited by inventoried capacity. Forest capacity is about 85% of demand for nonmotorized use and 31% of demand for motorized use. To satisfy 2040 demand for semiprimitive motorized and nonmotorized use, would require rehabilitation of roaded natural and roaded modified settings over a period of 30 to 50 years.

The public's desire for roaded natural recreation settings is accommodated at a high level in Alternatives J, W (PA), D and L. Alternatives D and L supply 100% of 2040 demand while Alternatives J and W (PA) accommodate 77% to 81% of future demand. The lowest response to public demand for this recreation setting is provided by Alternative NC by supplying 37% of 2030 demand. Other alternatives provide between 59% and 62% of future demand for the roaded natural setting.

Public demand for use of roaded modified opportunities in the year 2040 is fully satisfied in all alternatives.

Trails - Management areas, each with specific goals and standards applied in the alternatives, will have differing effects upon the trails located within them. However, groups of management areas may be expected to have some common characteristic effects on Forest trails. The most significant effects of management area activities on nonwilderness trails are due to timber harvest and road construction. Trails which traverse management areas having a high incidence of timber harvest and road construction are more subject to the effects of replacement and bisection by roads, and the encroachment of management activities on the visual experiences of trail uses than management areas with a lower incidence of these activities.

The removal of trees along trails through various harvest methods and associated post harvest practices will alter the basic character of trail settings and may displace trail use. During harvest and post harvest operations affected trail segments will become impassable or destroyed. The felling of trees, yarding, and residue treatment activities can block access of users and destroy or disturb trail surfaces. These effects will typically result in closures of affected trail segments, trail relocations and reconstruction of disturbed trail surfaces.
Road construction continues to have the greatest effect on the Forest trail system. As the Forest road network expands, more and more trails will be bisected or replaced. Bisection of trails interrupts an otherwise continuous trail-related experience or opportunity of both motorized and nonmotorized use. Often roads that bisect trails result in a shortened distance to a trail's destination. Trail replacement through road construction often results when a new road actually occupies the same grade and alignment of a trail, obliterating any evidence of its existence and providing access to the same destination.

A further consequence of replacement and bisection of trails, is the loss of trail related recreation opportunities and displacement of trail users. Extension of the Forest's road system has and may continue to shorten access and attract more use to many special areas and natural features resulting in increased compaction, displacement, and erosion of trail surfaces. In addition, as trail mileage is reduced from bisection and replacement, competition among mountian bikers, hikers, motorized trail bike users, and pack and saddle users for exclusive use is likely to increase.

Actual impacts to trails from timber harvest and road construction will be on a site specific basis. Effects cannot be determined until locations of harvest units and road segments are known. However, by comparing for each alternative the miles of Forest trails in management areas that permit timber harvest and road construction, with proposed harvest areas, the relative potential effect of each alternative can be assessed.

To illustrate the relative effect each alternative has on the Forest's existing trail system, management areas have been grouped into three categories, based upon their potential to affect trails. Table IV-23 illustrates the effects of the alternatives on trails based on these management area groupings.

Table IV-23 Effects on Existing and Potential Forest Trails in Miles

		Alternatives						
Effect Category [1]		NC	K	A	J	W	D	L
High	Existing	314	343	278	200	77	136	28
	Potential	38	83	83	171	231	204	315
Moderate	Existing	236	243	221	207	243	178	186
	Potential	199	121	193	160	171	133	127
Low	Existing	164	128	215	307	394	400	500
	Potential	315	348	276	221	150	215	110
TOTAL	Existing	714	714	714	714	714	714	714
	Potential	552	552	552	552	552	552	552

[1] **High** = Management areas with normal harvest levels and attendant road construction.
Moderate = Management areas with reduced harvest levels and limited road construction.
Low = Management areas with no programmed harvest and no road construction.

As illustrated in Table IV-23 each alternative will affect exisiting and potential miles of trails differently. Generally, alternatives that include more trails and potential trail locations within management areas that exclude or permit only low levels of timber harvest or road construction will maintain trail corridor environments in natural or natural appearing conditions. Alternatives J, W (PA), D and L maintain between 307 and 500 miles of existing trails and between 171 and 315 miles of potential trails locations in management areas that assure the protection of trail related values and experiences. Other alternatives, such as NC, K and A propose maintain 164 and 215 miles of existing trails and between 38 and 83 miles of potential trail locations in a similar manner.

Opportunities for mountian bike use, hiking, pack and saddle use, and trail bike use would be increased in some alternatives through construction of new trails. Alternatives W (PA) and D propose construction of 60 and 68 miles of new trails respectively, while Alternatives J and L propose 40 miles each. Alternatives NC, K, and A propose no new trail construction.

Off-Road Vehicles - The primary areas of off-road vehicle (ORV) use in the Forest include Santiam Pass, Willamette Pass, and the Oregon Cascades Recreation Area. Other areas of use include the upper reaches of the Middle Fork of the Willamette drainage and, during drawdown periods, the mud flats of Lookout Point and Hills Creek reservoirs. The proposed alternatives vary in their effect on the availability of recreation settings for ORV use. Since each management area either permits, restricts, or excludes ORV use, the type and distribution of management areas in each alternative will affect directly the location and amount of area to be provided for ORV opportunities. Management area 14a (General Forest) provides the greatest amount of area for this type of use opportunity. Table IV-24 illustrates the status of ORV opportunities in each of the proposed alternatives.

Table IV-24 Effects on Off-Road Vehicle Opportunities [1]

	Alternatives [1]						
	NC	K	A	J	W	D	L
Open	69	63	61	59	57	54	38
Restricted	1	7	6	6	6	5	3
Closed	30	30	33	35	37	41	59
TOTAL	100	100	100	100	100	100	100

[1] Values reflect percent of total Willamette National Forest acreage.

Management areas or portions of areas that restrict ORV use typically limit use during specified periods to reduce conflict with other uses and protect resources. Access to some areas of the Forest is controlled by season to avoid impacts to highly erosive soils, big-game calving and winter areas, threatened and endangered species habitats, and other types of seasonally dependent recreation use.

A reduction in the amount of area or miles of trail available to ORV use and subsequent displacement of use has several effects. Expected effects on remaining ORV areas include higher per acre use densities and increased potential of resource impacts. The potential for conflict among users is also expected to increase, particularly in those areas highly suited to some forms of nonmotorized recreation use such as cross-country skiing.

Alternatives NC and K increase from 2% to 8% the amount of Forest area open to ORV use over current levels. All other alternatives decrease the amount of Forest area available for ORV use from 2% to 23% below current levels.

Developed Recreation - Alternatives may affect developed recreation settings in three basic ways: by the elimination of sites, by the manner in which individual sites are maintained, and by the type of management that is proposed to surround individual sites.

The elimination or closure of some developed sites may affect other sites. The users of sites proposed for closure will be displaced into other developed sites, or will seek alternative experiences in undeveloped dispersed sites. Subsequent effects include: the possible overuse of other developed sites, the loss of a preferred user experience, and the increased potential of human-caused wildfire in dispersed camping sites. In addition, an increase in litter, human waste, vandalism, and related effects can be expected in dispersed sites.

An increase in the number of sites will provide for a growing demand for some forms of developed recreation, tend to reduce overcrowding and overuse of existing sites, and offer a more diverse range of opportunities. Table IV-25 illustrates the number of sites proposed by management sector in each of the alternatives.

Table IV-25. Effects on Developed Recreation Opportunities [1]

		Alternatives [1]						
Management Sector	Current Inventory	NC	K	A	J	W	D	L
Public Sector	174	174	214	174	178	199	188	174
Private Sector	30	30	44	30	41	36	34	30
TOTAL	204	204	258	204	219	235	222	204

[1] Values are expressed as number of sites.

As illustrated in Table IV-25, the alternatives would affect the availability of both public and private sector sites. Alternatives K, J, W (PA) and D increase the total number of developed sites by 54, 15, 13, and 18 respectively, over current inventory levels. Alternatives NC, A, and L propose maintainingdeveloped sites at current levels. In addition to increases in total number of new sites among some alternatives, the emphasis between public versus private sector management shifts among some of the alternatives. Alternatives K, J, W (PA), and D propose increasing the number of developed recreation sites to be managed by the private sector from 30 to 44, 41, 36, and 34 respectively.

Actual management of individual sites is based upon their assigned service level for operation and maintenance. The level of service assigned is based on use capacity, site protection needs, and seasonal demand for public use. Sites assigned to a less than standard service level of maintenance, as compared with sites that are managed at the standard service level, will not be provided with law enforcement patrols, garbage pickup, potable water, grounds cleanup and brushing, or sign maintenance. However, safety hazards will continue to be minimized and no fees will be charged for use of less than standard service sites. The frequency of other site maintenance activities, such as sanitation, will be reduced from a daily to a weekly occurrence.

Likely consequences of these actions include a potential increase in rodent populations, reduction in aesthetic appearance of sites, and the need for users to pack out their own garbage, and provide their own water and toilet supplies. Table IV-26 illustrates the relationship of less than standard service sites to standard service sites in each alternative.

Table IV-26. Proposed Management of Developed Recreation Settings

		Alternatives [1]						
Operation and Maintenance Levels	Current Inventory	NC	K	A	J	W	D	L
Standard Service	122	122	176	122	137	153	140	122
Less than Standard	82	82	82	82	82	82	82	82
TOTAL SITES	204	204	258	204	219	235	222	204

[1] Values are in number of sites.

As illustrated in Table IV-26, the alternatives would affect the operation and maintenance levels of developed recreation settings. Operation and maintenance levels of developed sites change only for the standard service level among the alternatives.

Alternatives K, J, W (PA), and D all increase the number of sites to be managed at the standard service level. Increases over current levels range between 15 and 54 sites. Alternatives NC, A, and L maintain standard service site management at current levels. The number of sites to be maintained at a less than standard service level remain the same among all alternatives.

Timber harvest and road construction activities in areas surrounding developed sites could affect the setting of those sites and the experience of users if activities affect the developed area or if users venture beyond the sites into the surrounding landscape. In either case, harvest activities can change the character of the surrounding area in a manner that may preclude experiences and opportunities typically associated with developed site use, or in the vicinity of developed sites, such as hiking, fishing, sightseeing and nature study.

Road construction and harvest activities could result in increased sedimentation affecting fish habitat and fishing quality. These activities can also result in a heightened sense of industrial activity in the area from increased noise levels and, therefore, a reduction in the quality of the overall recreation experience.

The alternatives provide a high degree of protection for the settings of both existing and proposed developed recreation sites from surrounding management influences. Most sites are surrounded by management areas that permit only low levels of harvest and road development and, are therefore, buffered from the normal effects of forest industrial operations. Alternative K provides the least protection for developed settings from surrounding influences, while alternatives D and L provide the most.

The effects of the alternatives on the Forest's ability to satisfy user demand in the future is based on the total number of sites provided and their inherent use capacity. Furthermore, the ability of the Forest to provide for some increases in types of developed recreation use, such as downhill skiing, is based on whether new development or expansion of existing sites is proposed. Table IV-27 illustrates the total number of developed sites to be provided by each alternative and the percent of expected 5th decade (2040) demand they would provide.

Table IV-27. Effects on Managed Sites and User Demand

		Alternatives [1]						
Category	Current Inventory	NC	K	A	J	W	D	L
Existing Sites	204	204	204	204	204	204	204	204
Proposed Sites	0	0	54	0	15	31	18	0
TOTAL SITES	204	204	258	204	219	235	222	204
RVD DEMAND [2]	57%	57%	100%	57%	62%	69%	63%	57%

[1] Values are expressed as number of sites.
[2] Alternative values are in percent of 2040 RVD demand; 4,481,300 RVDs.

As indicated in Table IV-27, Alternatives A, J, and L supply between 57% and 62% of developed recreation demand expected in the year 2040, while Alternative K provides 100%; W (PA), 69%; and L, 85% of expected future demand.

Within the spectrum of developed recreation opportunities that the public desires, downhill skiing is the most significant in terms of required facilities, capital investment, and development area; however, it represents only about 3% of the total estimated demand for developed recreation use. Projected annual user demand for downhill skiing in 2040 (117,100 RVDs) is accommodated with existing facilities. However, permit areas for both Hoodoo Ski Bowl and Willamette Pass Ski Area have been enlarged to develop additional capacity to provide expanded opportunities during peak use periods, currently limited by installed lift capacity. All alternatives provide for expansion of Hoodoo Bowl and Willamette Pass Ski areas.

Cumulative Effects on Recreation

As natural settings are altered through timber harvest and road construction, the capacity of the Forest to provide some types of dispersed recreational settings and experiences is diminished. The greater the shift from unroaded recreation to roaded recreation in the alternatives, the greater the cumulative effect on semiprimitive (motorized and nonmotorized) recreation opportunity settings. Alternative K will have the greatest effect on this type of setting as only 21% of potential will be provided. Alternative D would have the least effect as 71% of inventoried potential will be maintained. Other alternatives would maintain between 32% and 66% of the Forest's semiprimitive opportunity settings.

Another effect of managing recreational settings is that over time, some characteristics of developed sites are lost as a consequence of recreational use and maintenance, and sites take on a "well groomed" appearance. This effect, coupled with limited new site development, would narrow the range of developed recreation setting opportunities by stratifying them at a high level of development

Alternatives NC, A, and L have the greatest effect by narrowing the range of developed recreation settings available for public use. Alternatives K, J, W (PA) and D have the least effect, as they increase the total number of sites and broaden the range of available developed recreation settings.

As road construction and timber harvest activities are implemented over several decades, they have the potential to affect an increasing amount of trail mileage. The effects of bisection and replacement

are greatest in alternatives NC, K, and A. Alternatives W, D, and L are likely to have the least effect as fewer miles of trail are exposed to future road construction and timber harvest activities.

Mitigation Measures for Recreation

The quality of recreational settings in the Forest would be managed in all alternatives through the application of standards and guidelines which apply to all management activities. Relative to the type and level of recreation use, mitigation measures consist of a broad scope of actions that avoid, minimize, rectify, reduce, or compensate for environmental impacts.

The effects of intensive Forest management activities, such as noise and visibility of activities and equipment adjacent to semiprimitive settings can be mitigated by: limiting the proximity of roads; modifying the extent or nature of proposed activities; and scheduling activities during periods of low public use.

Transportation systems and roads affect access to and impacts on both dispersed and developed recreational settings in the Forest. Uncontrolled off-road vehicle (ORV) use increases the risk of degrading the recreational experience because of damage to vegetation both within and adjacent to designated use areas. The risk of damage can be lessened through area controls and public contact. Area improvement and rehabilitation plans and projects can be developed and implemented by groups of ORV users.

In some situations, the effects of crowding on campsites and trail systems can be reduced by dispersing recreation use into other areas where timber harvest is not active. Road closures in these areas can make additional settings available to recreationists who do not object to hiking and camping where there is evidence of harvest activity.

To maintain semiprimitive experiences, group sizes would be regulated, campfires may be limited to designated areas, and visitor contacts would be made by Forest officers to ensure compliance with established management standards and permit requirements.

Losses of trail systems as a result of timber harvest can be offset by alternate ways of locating and scheduling road construction and the cutting of harvest units. In some areas there is also the potential for relocating trails, rehabilitating older, nonmaintained trails, or rehabilitating trails in place after timber harvesting is complete to supplement access.

Increased use of trails and dispersed campsites where there are no sanitary facilities would be accompanied by increased levels of human waste. If trails or dispersed campsites are located near water features, the risk of reduced water quality is increased. The location and magnitude of this effect is lessened by backcountry ranger contact with users, toilet facilities to protect resources and human health and safety, and if necessary, area closures.

As a result of providing recreational opportunities in a visually appealing and safe forest setting, there are impacts on vegetation and timber resources. In developed sites, selected silvicultural practices would be utilized to protect vegetation from insects and disease, perpetuate healthy vegetation, and establish viable vegetative cover. Diseased or hazardous trees located in recreation sites or along trails may be removed for the safety of Forest users.

Because dispersed activity can significantly disturb soil, duff, litter layer, and vegetation, Forest guidelines for all the alternatives set standards for dispersed campsites and prohibit camping within a 100 feet from lakes, streams, trails and key features. The use of camping sites near streams or lakes concentrates fishing pressure, decreases fishing success, and reduces riparian vegetation by trampling. Increased

motor vehicle activity and/or use of pack and riding stock near water courses and lakes can cause erosion, sedimentation, and degradation of fish habitat. These effects can be mitigated by limiting times of use to avoid periods when the ecosystem could be unacceptably damaged. Mitigation could also include site rehabilitation, seasonal and permanent road and/or area closures, and restrictions on dispersed campsite locations.

Developed recreation sites are vulnerable to both costly vandalism and overuse, which can adversely effect facilities, soils, vegetation, and aquatic resources. Measures used to mitigate these impacts, if they occur, include site rehabilitation, re-distribution of use into underutilized sites, scheduling shorter use seasons, raising fees, and concentrating funding on cost effective developed sites. Proposed recreation sites, as in Alternatives K, J, W (PA), and D, would have comprehensive and detailed plans prepared in accord with requirements specified in Forest Service Manual 2330 (Recreation Management) before construction or expansion would occur.

Relationships With Other Agency Plans or Policies for Recreation

State and local planners, and members of the private sector, recognize the importance of recreational settings to both the tourist industry and the local economy. In response, some local communities are beginning to promote year around tourism as a means of diversifying their economic base. The State Tourism Council is also pursuing destination point futures for Oregon. Toward this end some communities may become increasingly dependant upon the Forest and it's varied resources to attract visitors.

Although none of the alternatives are in conflict with current Army Corps of Engineers plans, proposed changes in reservoir water levels for Hills Creek and Lookout Point reservoirs by the Army Corps of Engineers may conflict with existing or potential recreation activities and developments. Each proposal will be fully evaluated in regards to the recreation setting on a case by case basis.

Consultation is also made with other agencies such as the Oregon State Division of Parks and Recreation, the Oregon Department of Fish and Wildlife, and the State Historic Preservation Office regarding the management of existing or potential recreational settings. While the effects of implementing any of the alternatives are not expected to conflict with the majority of the objectives identified by these constituencies, a high level of public contact and coordination between the Forest Service and others will be maintained.

Incomplete or Unavailable Information

Information on the factors affecting user demand or activity preferences is insufficient to project or estimate future use levels for recreation activity types and as a basis to effectively scheduling the delivery of recreation services, facilities or opportunities for public use.

Environmental Consequences Of The Alternatives On The Social And Economic Setting

The social and economic environment that surrounds the Forest will be affected as a consequence of implementing any of the proposed alternatives. Change will occur through various direct and indirect effects on the communities, industries, and people that rely on the Willamette for employment, recreation, and other goods and services.

The intent of the Forest Service management was stated shortly after the turn of the century as "the greatest good for the greatest number in the long run." It essentially means that the National Forests were established not for any single group, industry, or individual, but rather for the present and future benefit of the people of the United States. This sort of utilitarian philosophy has been the guiding principle of National Forest management ever since. Thus both local and national issues and concerns are considered in Forest Service policies and decision-making.

Management of Forest resources affects many of the people and communities in Lane, Linn, and Marion counties which make up the Forest's primary area of influence. The alternatives, which show different combinations of management options, will have certain impacts or effects on people who are employed by the Forest Service, those who work under contract for the agency, and businesses that use or renew the many resources of the Forest. The counties receive monies equivalent to 25% of the gross timber receipts (50% on O&C land timber) in lieu of taxes that could be generated from the National Forest land. The counties also receive 25% of the total revenues derived from other resource uses on the Forest, including campground receipts and grazing fees. The Forest also has a direct effect on recreation users, including individuals, families, and organized groups. These people use the Forest for a wide variety of recreation opportunities that vary from Wilderness to developed campgrounds and resorts. The opportunities for participating in these leisure activities vary by alternative.

The socioeconomic environment is affected by changes which are subtle and quite often difficult to measure. These are indirect impacts which include expected changes in secondary employment due to changes in direct employment. Thus, the car dealer or grocery store may be affected by changes in the number of sawmill or Forest Service workers that are employed. Likewise, the employment and projects partially supported by the county monies will have indirect impacts that are real, but difficult to quantify. Feelings of satisfaction with the local area influence citizens beliefs, attitudes, and enjoyment of their work and leisure activities. These are considered to be indirect because of the many other factors that may influence the people in an area more directly. These include home mortgage interest rates, availability of work, hourly wages or salaries, family ties, savings, and amount of leisure time.

The range of alternatives shows considerable variation in the resource outputs that can have an impact on the socioeconomic environment. For example, in one alternative the amount of timber to be sold could be 75% less than current volumes while available recreation opportunities increase. Effects would include a reduction in total jobs and county revenues and potential increases in recreation use if the alternative were implemented. The secondary impacts would also be estimated in terms of the types of businesses that rely on income from timber processing employees, as well as aspects of the community that would benefit through an increase in recreation visits to the Forest.

Effects of the Alternatives on the Social and Economic Setting

There are several basic factors that vary by alternative, with respect to their impact on the socioeconomic environment. They are: (1) jobs, which are heavily influenced by the amount of timber sold and subsequently harvested; (2) income, which is affected by dollar flows throughout the county; (3) payments

to the counties which affect county funding, especially for schools and roads; (4) lifestyles, reflected in the amount of recreation opportunities or traditional Native American uses; and (5) community cohesion, which reflects the amount or type of natural resource or Forest management issues which pull together or split the communities.

In addition to the factors that vary by alternative, there are several national social equity concerns that do not vary by alternative. As a public agency, the Forest is committed to the management and development of an organization reflective of the national diversity found in the public we serve. The Federal Small Business Administration (SBA) procedures encouraged small businesses to bid for Forest Service contracts and timber sales. Another Federal program provides for minority and women owned business contracting and encourages participation in the Forest contracting program. The timber sale bidding process allows businesses to be competitive in an open setting.

Federal Equal Employment Opportunity (EEO) and Affirmative Action policies and programs guarantee and encourage equal access to and participation in all Federal resource and employment opportunities. Federal EEO programs include Special Emphasis Programs which advocate the employment and upward mobility of women and minorities in the U.S. Department of Agriculture--Forest Service. These EEO Programs include the Federal Womens Program; the Hispanic Employment Program; the Native American Program; the Human Resource Program, and the Volunteer Program.

Jobs - The Forest has the potential to affect the total number of jobs in its area of influence (Linn, Lane, and Marion Counties) as a result of the mix and level of goods and services provided in each alternative. The assumption in estimates of job impacts is that other supply and demand factors affecting the "markets" for Forest products and uses are constant. This assumption becomes more tenuous the further out in time projections of effects are made. For example, the amount of timber offered for sale by the Forest is not, and will not be, the only factor to affect the number of jobs in the timber industry. Timber supply and demand, thus the number of jobs in the wood products industry are influenced by numerous factors including worker productivity, union and non-union wage and benefit agreements, interest rates for home mortgages and business loans, modernization of the mills, closing of mills that cannot make a profit, import and export levels, production and shipping costs, regional competition, private and public land harvest levels and policies, volatility of the lumber, plywood, and chip markets, and estimating what the availability and price of raw materials and finished products will bring. The analysis of effects in this FEIS is on the comparison of potential first decade changes in the number of jobs for each alternative relative to a base historical level. The base historical level is based on the time period 1980 to 1989.

The number of jobs associated with each alternative was estimated using an input-output model called IMPLAN. In this model, job estimates are a function of changes in final demand resulting from changes in output levels. Changes in output or activity levels initiate expenditures in various sectors of the local economy which trigger the change in jobs and income. On the Forest, job and income effects are based on changes in four major outputs: the amount of timber volume expected to be harvested, recreation use, payments to counties, and Federal government expenditures.

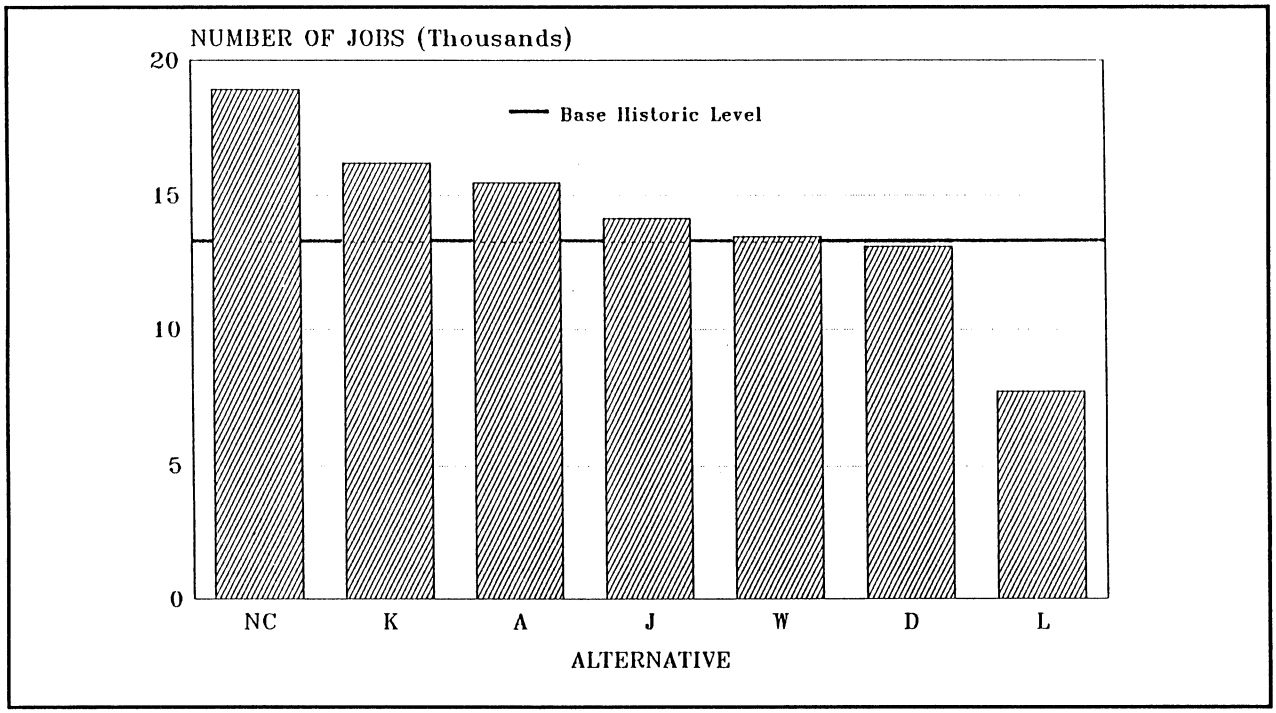
The following discussion of potential changes in jobs will focus on changes in the total number of jobs. To estimate the potential changes in jobs and income associated with each alternative, a base level was established for each output. This base represents a multi-year average of historic output levels between 1980 and 1989. The average number of jobs during this period was 13,257. For more detail regarding assumptions, methods of analysis and alternative outputs refer to Appendix B, *Social Impact Assessment.*

Alternative NC would provide the greatest amount of jobs, approximately 5,654 jobs more than the base level. This reflects a projection of the potential yield for timber in the current Forest Plan (1977) which is significantly higher than the amount actually harvested over the base period. The timber harvest level in the NC Alternative was calculated with a different set of assumptions than were the other alternatives. For more details see Chapter II, *Comparison of Alternatives*.

Alternative K would provide the most jobs relative to the historic level, with nearly 2,945 additional jobs in the first decade. Most of these jobs are related to increased timber harvest. Alternative A would also provide a very high number of jobs with first decade job increases approximately 2,218.

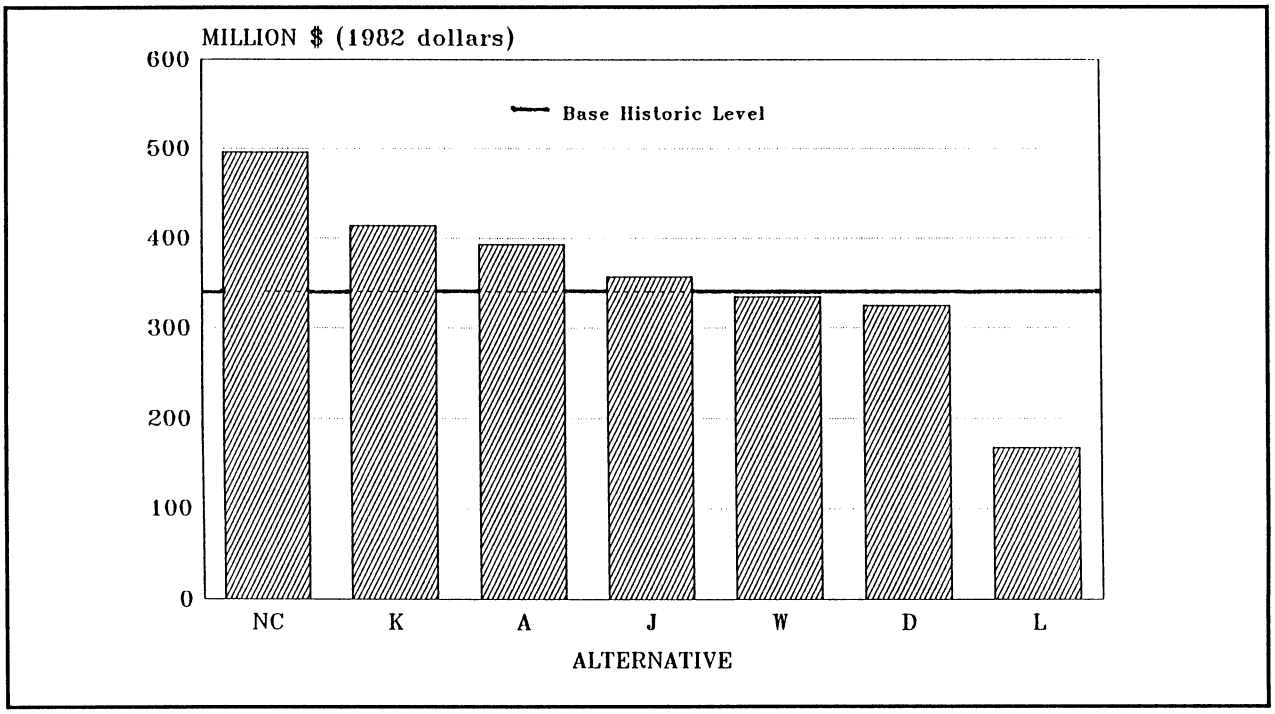
Total employment in the first decade would increase above the historic level in all alternatives except D and L. Total jobs in the first decade would be reduced by almost 167 in Alternative D and 5,499 in Alternative L. These reductions occur primarily because of reduced timber harvest volumes. Though a net increase in jobs is expected, Alternatives J and W would cause a loss of 272 and 815 jobs, respectively, in timber related employment. Recreation related jobs are expected to offset many jobs lost in timber related employment. All alternatives would provide more recreation-related jobs or jobs primarily in the lodging and food industries. Figure IV-20-1 displays the total jobs by alternative and the base historic level. The table associated with Figure IV-20-1 also shows the changes in jobs by alternative relative to the historic base level and relative to the NC Alternative.

Figure IV-14 Total Jobs



Income - Income was also estimated for the first decade with the IMPLAN model and compared to the historic level. Alternatives NC, K, A, and J would increase total income for the first decade. Alternatives W and D would have an income level below the historic level, while total income for Alternative L would fall to 50% of the historical base average. Decreases in total income for Alternative W, D, and L can be best accounted for by the relative decreases in timber related employment. Figure IV-15 displays the total income by alternative and the average base historic level (1980-1989).

Figure IV-15. Total Income



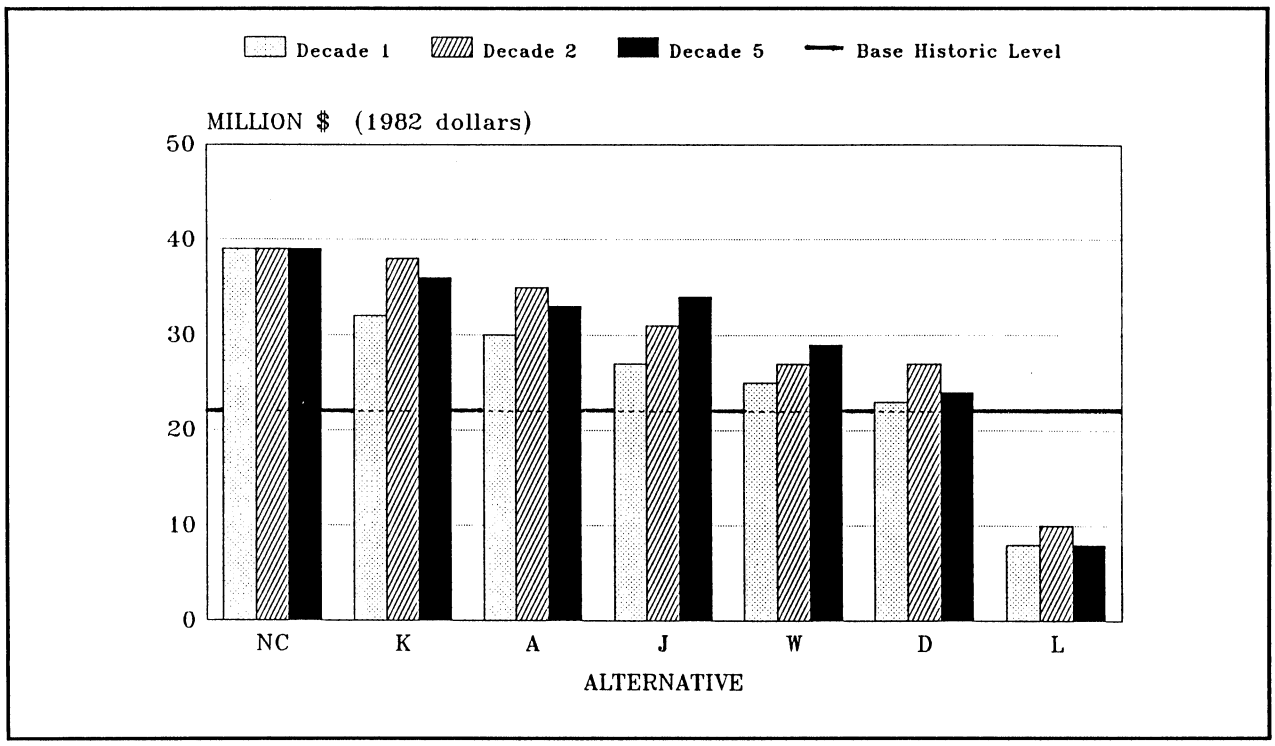
Payments to the Counties - Dollar payments to the counties are based on the 25% formula for uses of National Forest land and resources that generate income for the Federal government. These funds, by law, are to be only used for roads/highways and public schools, while the Oregon and California (O&C) land revenues (which are 50%) can be used for any purpose. The vast majority of these payments come from timber harvests. Thus, when there is a reduction in Forest receipts, the counties must find other sources of revenues to maintain the same funding levels for school and road programs. This could decrease the money available for other programs.

It is recognized that a thorough analysis of the effects resulting from increasing or decreasing timber supply requires an assumption that timber values fluctuate on demand. For example, alternatives that provide reduced timber harvest levels may generate more dollars per unit measure than alternatives producing higher timber harvest levels. However, the complexities involved in estimating supply and demand are beyond the scope of the analysis done by the Forest. The analysis in this FEIS assumes timber values remain constant regarless of supply.

Payments to counties would be above the historic average in Alternatives NC, K, J, and W in the first decade. The returns for Alternatives NC, K and A would be the highest of all alternatives, while in

Alternatives D and L, they are the lowest. Alternative W would be above the historic average (1980-1989). These amounts directly reflect the projected level of timber harvest by alternative and expected value of stumpage. Figure IV-16 displays estimated payments to counties for the first, second, and fifth decades.

Figure IV-16 Payment to Counties



Lifestyles - Lifestyles could be influenced in an alternative by the amount of recreation, hunting, fishing, and visual quality. In terms of the recreation and leisure opportunities on the Forest, all alternatives increase recreation emphasis, with Alternatives K, J, W, and D providing additional new developed sites. All the alternatives provide a wide range of dispersed recreation activities but vary their emphasis as related to diversity of opportunity. Alternatives NC, and A place a moderate emphasis on semiprimitive motor and nonmotorized activities, while Alternative K provides primarily roaded natural and roaded modified recreation opportunities with a minor amount of area provided for semiprimitive opportunities. Alternatives J, W, D, and L provide the most diverse range of recreation opportunities among the alternatives.

With respect to Wilderness, Alternatives W, D, and L provide the highest quality experience opportunities, and the least amount of use during the planning horizon, as a response to conditions of resource damage and over-use in some Wildernesses. Alternative J also provides for higher quality opportunities over current conditions through lower overall Wilderness use levels. Alternatives K and A maintain the current uses and quality of Wilderness and provide for the same levels of expected use in the future.

Alternatives NC, K, and A would maintain the current trail systems while Alternatives J, D, and L provide 40 miles of new trail construction and Alternatives W and D provide at least 60 miles of new trail construction.

Deer and elk hunting opportunities would vary significantly between alternatives. NC would reduce habitat capability for deer and elk and could cause limited opportunity to hunt deer and elk. Alternative K and A would reflect current opportunities the first decade and then decrease in future decades. Alternatives J, W, L, and D, respectively, would increase opportunities to hunt deer and elk as populations respond to habitat conditions.

Fishing opportunities on the Forest will vary considerably through the alternatives, with both anadromous and resident fish use highest in Alternatives W, D, and L. Alternatives K, A, and J will have the same level of resident fish use, but Alternative J has the highest anadromous fish use of the three and Alternative K the lowest. Anadromous fish use in all alternatives is expected to increase in the second decade and then level off. Resident and anadromous fish use was not estimated for the NC Alternative.

Firewood availability for home heating in the first decade will be lowest in Alternative L. Alternatives K, A, J, and W will have similar firewood opportunities. The most firewood will come from Alternative NC. Firewood availability will remain constant in the second decade except for a slight increase for Alternative D. By the fifth decade firewood availability will decrease by more than 50% for all alternatives except J and W which will have decreases of 27% and 41%, respectively.

Community Cohesion - Community cohesion could be affected by the amount of land available for specific resource uses, especially timber harvest, old growth, undeveloped areas, and pending decisions regarding spotted owl protection. It is expected that polarization (issues which split the community) would increase as alternatives approach the extremes in terms of acres allocated to one or more of these uses. In alternatives that address key resource issues with similar emphasis, it is expected that community cohesion would be present but not in the degree found in the extreme alternatives. However, with the total reduced timber sale/harvest levels in almost all alternatives, as well as related issues such as the continued controversy over the amount of protection for the spotted owl and old growth, it is expected that a high degree of polarization will continue for several years, perhaps until the next planning period. The following discussion addresses those issues expected to most effect the degree of polarization in communities.

Alternatives D and L provide the least amount of acres available for timber harvest activities on the Forest, with Alternative L about two-third of the current level. Alternatives J and W also have fewer acres allocated to timber harvest than in the Current Plan (same as Alternative A), whereas Alternatives NC and K have more acres for timber harvest than the current level.

Old-growth acres will be reduced in all alternatives over time. Alternative L provides the most old growth in all decades, and Alternative D provides the next highest. Alternatives NC, K, A, and J provide a low amount, with Alternative NC having the lowest of all the alternatives. Old growth in Alternatives W and D have more than Alternative A in the first decade, with Alternative D being just above Alternative W by the fifth decade.

Spotted owl habitat will also vary with Alternative L protecting the most owl sites (184), followed by Alternative D (102). Four Alternatives (K, A, J, and W) are at the Management Requirement (MR) level plus some additional owls present in Wilderness. Alternative NC does not protect any owl sites outside of Wilderness or other protected areas; therefore, the NC Alternative provides the least habitat areas of any alternative since MRs are not included.

Alternative L maintains the most (85%) inventoried roadless areas in an undeveloped condition. Alternatives D and W provide somewhat lower amounts but each has more than 50% of the total inventory assigned to unroaded prescriptions. Alternatives A, J, NC, and K maintain less than half of the roadless areas in an undeveloped condition with Alternative K maintaining the least (15%).

Cumulative Effects of the Alternatives on the Social and Economic Setting

The cumulative effects of an alternative on the socioeconomic environment are quite difficult to estimate. One basic problem is that job impact data, especially secondary effects, are dated or nonexistent (1977 base updated to 1982). There is good data on counties and large cities, but for smaller towns the information is incomplete. Another factor is that the severe recession of the early 1980's has fundamentally changed the economy of affected counties and especially the smaller towns and industries. This occurred in spite of the fact that the sale (but not harvest) of Forest timber and recreation opportunities remained constant.

In terms of cumulative effects, Forest timber volumes for sale may have little influence on any one mill, for example an owner can purchase from Bureau of Land Management and private woodlot owners to get additional supply. They can also purchase logs from the Umpqua or Siuslaw National Forests. Or, at the owners choice, they can increase or reduce the size of the mill operation, sell the operation to another company, or simply close the mill. All of these have occurred in the last decade and few, if any, of the changes to companies or communities can be tied directly to the sale of Willamette National Forest timber.

The yearly timber harvest level, rather than the sale level, and production in the mills depends on economic factors outside the control of the Forest. These external factors include, but are not limited to, interest rates, housing starts, marketing of products (including demand for products, bid prices on resources, product pricing, and availability of foreign markets), domestic and foreign competition, international tariffs, and exchange rates. Additional factors that affect companies and individuals that use Forest resources, which employ thousands of people in the primary area of influence, include capital investments (including plant modernization), profits, losses, as well as wages, benefits, and working conditions for employees, structure of the companies/corporations, tax rates and breaks, efficiency of the company operations, and productivity of the workers.

Other timber and recreation suppliers (Bureau of Land Management, Oregon State Forestry, private industry, and woodlot owners) play important roles in the jobs, income, dollar returns, lifestyles, and community cohesion in the affected counties. Cumulative social and economic impacts are most effected by external business decisions rather than most variations shown in the Forest Alternatives.

Mitigation Measures for the Social and Economic Setting

Management of the Forest's natural resources affect many of the people and surrounding communities. Recently disputes over old-growth forests and spotted owl habitat has resulted in the reduce sale of timber and consequent reductions in natural resource payments to counties for road and school budgets. Resource dependent communities are also threatened by changing policies in Congress and Federal land management agencies. In response to growing concern over the economic vitality of communities the Forest Service serves and the pressure and change taking place in natural resource management, Region 6 has recently adopted a proposal designated the "Pacific Northwest Strategy".

The Pacific Northwest Strategy is a regional effort of the Forest Service to form partnerships focused on helping resource-dependent communities prepare for and achieve their desired future. The intent

of the Pacific Northwest Strategy is to assist resource-dependent communities in preparing and managing their future by:

- Developing future community leadership,
- Strengthening basic education,
- Establishing a sense of community pride, ownership, and belonging,
- Actively incorporating family, children, and youth,
- Identifying needs and resources,
- Assuming ownership responsibilities to local jurisdictions by all land ownerships.
- Creating partnerships and networks,
- Coordinating among local, State and Federal efforts.

Relationships with Other Agency Plans or Policies for the Social and Economic Setting

Bureau of Land Management (BLM) - Coordination between the BLM and the Forest Service is occurring at the BLM State Office and Forest Service Regional Office regarding planning efforts of both agencies. In addition, coordination occurs between the BLM-Eugene District and BLM-Salem District and the Forest. In terms of socioeconomic effects, the common area of concern between the agencies is the distribution of Federal monies due to the presence of Federal lands in each county. For the Forest, the distribution of Federal monies to the counties depends almost entirely on the timber harvested and the amount of National Forest and O&C Lands in each county.

State Forestry Program for Oregon (FPFO) - The Oregon Department of Forestry (ODF) has developed, in conjunction with the State Board of Forestry, the "Forestry Program for Oregon". At one point, a key to this program for the Forest was the output levels assigned to the various land "owners" (state, private, industrial, and federal) required to accomplish the coordinated programs envisioned.

The volume figure previously given the Forest as an objective, however, is no longer considered an accurate reflection of the objectives for the FPFO or an objective for the Forest to consider in its implementation of the Plan (State Forester letter, March 21, 1990). The target represents data that were collected over a decade ago and that were published based on a situation that existed in January, 1980. The Program has been re-focused on the intent of Oregon's forestry programs rather than on a comparison of numbers. The ODF recognizes that there are legal constraints the Forest must abide by in setting harvest levels.

The objectives of the new FPFO relevant to the Forest Plan and FEIS are:

1. Preserve the forest landbase of Oregon and assure practical forest practices that conserve and protect soil productivity, and air and water quality by:
    - Developing land use recommendations that recognize that forests are dynamic and most forest uses are compatible and that emphasize the integration of forest land uses;

- Encouraging federal agencies to maintain as large and as stable a commercial forest landbase as possible and to minimize future withdrawals from this landbase;

- Recommending that habitat should be managed based upon sound research data and the recognition that forests are dynamic and most forest uses are compatible over time; and

- Cooperatively establishing forest management standards and regulations for the protection of necessary habitat that are based upon the best knowledge available and that are consistent with responsible forest management.

2. Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations and considering landowner objectives by;

    - Promoting timber growth and harvest on public lands in a manner consistent with the governing statutory direction while seeking to meet Oregon's timber needs through the application of enlightened land and resource management.

    - Supporting the use of intensive timber management practices where professionally, environmentally, and economically sound.

    - Supporting federal policies and initiatives that provide sufficient funding for forest management and timber sale programs on federal land.

3. Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation and scenic values on all forest lands, consistent with landowner objectives by;

    - Encouraging a full range of recreational opportunities on both public and private lands consistent with landowner objectives.

    - Promoting adequate funding for the full implementation, operation and maintenance of forest recreation facilities, including campgrounds, trails, etc., on public forest lands allocated for forest recreation.

4. Devise and use environmentally sound and economically efficient strategies to protect Oregon's forests from wildfire, insects, disease, and other damaging agents by;

    - Encouraging cost-effective federal fire management policies that emphasize planned ignitions over natural ignition fires and that consider impacts to the state's fire protection program.

    - Encouraging that federal plans which develop and implement fire suppression policies be coordinated with the state.

    - Promoting the effective use of integrated pest management as a coordinated approach to pest control actions.

Table IV-10 in the Vegetation section of this Chapter, illustrates how acres are allocated under each alternative to full yield or partial yield.

State of Oregon Land Conservation and Development Commission (LCDC) - The State of Oregon has mandated a county planning program. At this time, the Counties of Lane, Linn, and Marion have completed their LCDC plans. Lane County is currently in the process of revising their plan with respect to the uses of primary and secondary forest land. An Oregon statute requires that the County plans be coordinated with all levels of government (ORS 197.015(5)). In addition, LCDC Goal Number 2 requires that "City, county, state, and federal agency and special district plans and actions related to land use shall be consistent with the comprehensive plans of cities and counties and regional plans." The guidelines for this goal include the following statement: "During the preparation of their plans, federal, state, and regional agencies are expected to create opportunities for review and comment by cities and counties." Review of the primary county plans and proposals for revision has occurred at the Ranger District and Supervisor Office levels on the Forest. In addition, the Forest has consulted with the counties regarding the DEIS and Proposed Forest Plan and has remained in contact with County Commissioners through meetings and periodic mailings of planning newsletters.

The counties in the Forest's primary area of influence are concerned about the economic well-being of their businesses and citizens as well as the overall livability of the area. Objectives associated with these concerns are not always complimentary and result in the need to seek a balance between competing interests at all levels of planning.

Incomplete or Unavailable Information on Communities

Predictions of effects were made with the most current information available. The following topics which effect these predictions require additional information to allow more accurate predictions:

- Future social and economic trends that would influence local communities. For example, the effects of forest timber supplies on local commnities might by amplified or offset by changes in the national and international demand for wood products, advances in mill technology, log export restrictions, and incentives for timber supplies from other land owners. Also, the aesthetic ties between the forest and the communities would be influenced by demographic and economic trends of the local population.

- Future management and resource outputs on lands other than the Forest.

- Community specific information on effects.

- Data on nonlinear relationships between resource outputs and jobs/income.

- Changes in the relationship between forest outputs and jobs and income that have occuryed during the latest national economic cycle.

Environmental Consequences Of The Alternatives On Scenery

The scenic importance of a Forest area is based upon its proximity to travelways and use areas, its relative attractiveness, and the concern users have for scenic quality. Although the degree of visitor sensitivity to the visual environment is difficult to quantify, many people expect to see a naturally appearing landscape in the Forest environment.

All of the alternatives contain activities that change the natural appearance of the Forest by reshaping landforms or altering the vegetative cover of the landscape. Activities associated with timber harvest generally have the most widespread consequence, though road construction, building, and site development also affect scenery. Significant activities introduce line and color changes that contrast with the natural landscape. These physical changes have the potential to dominate a scene and alter its esthetic value.

There are ten viewshed areas in the Forest which are used to display the likely consequences of the proposed alternatives. The effects of the alternatives are estimated by first determining the level of visual quality to be provided, and secondly, by comparing that level of proposed visual quality with the Existing Visual Condition (EVC) of each viewshed.

In the alternatives, each viewshed is allocated to several management areas. Each management area is assigned a Visual Quality Objective (VQO). These VQO descriptions are described in detail in Chapter III, Scenery. The assigned VQOs are designed to manage both long and short term visual effects and range from preservation to maximum modification. Each proposed alternative will vary in its effects based on the amount of area allocated to each management area within specified viewsheds.

The amount and distribution of each VQO, in aggregate, determines the level of proposed visual quality in each viewshed. The aggregate visual quality proposed for each viewshed is compared with its existing visual condition to determine the expected effects of each alternative.

The EVC of each viewshed is expressed in degrees of apparent landscape alteration. EVC categories include naturally appearing, slightly altered, moderately altered, and heavily altered. Effects that each alternative have on viewsheds are expressed as changes from current EVC levels.

Direct and Indirect Effects of the Alternatives on Scenery

The most obvious and significant effects on scenery are from vegetation and landform alterations typically associated with such resource management activities as timber harvest, road construction, recreation facility development, and mineral exploration. These activities have the potential to alter the natural attributes of landform, vegetation patterns and textures; create stark and dramatic contrasts of exposed soil surfaces with surrounding vegetation; and introduce structural features, such as buildings, utility structures, and electronic towers into the natural landscape. The clearcutting and shelterwood methods of tree removal create openings in the Forest canopy resulting in distinct contrasts between exposed soil and the surrounding landscape. These created openings will vary in their effects on scenery depending on their size, shape, location, and proximity to other openings. Created openings that exhibit attributes of scale, edge effect, shape, and location characteristic of natural openings in the surrounding landscape will have more favorable effects on scenery. Openings that are geometric in shape and large in size relative to natural openings in the surrounding landscape will have an adverse effect on scenery.

Road construction also creates linear openings in the Forest canopy. Roads, primarily in mid-slope locations in steep terrain, often result in the exposure of cut and fill slopes and tree boles, creating an unnatural line effect in the landscape that is usually permanent.

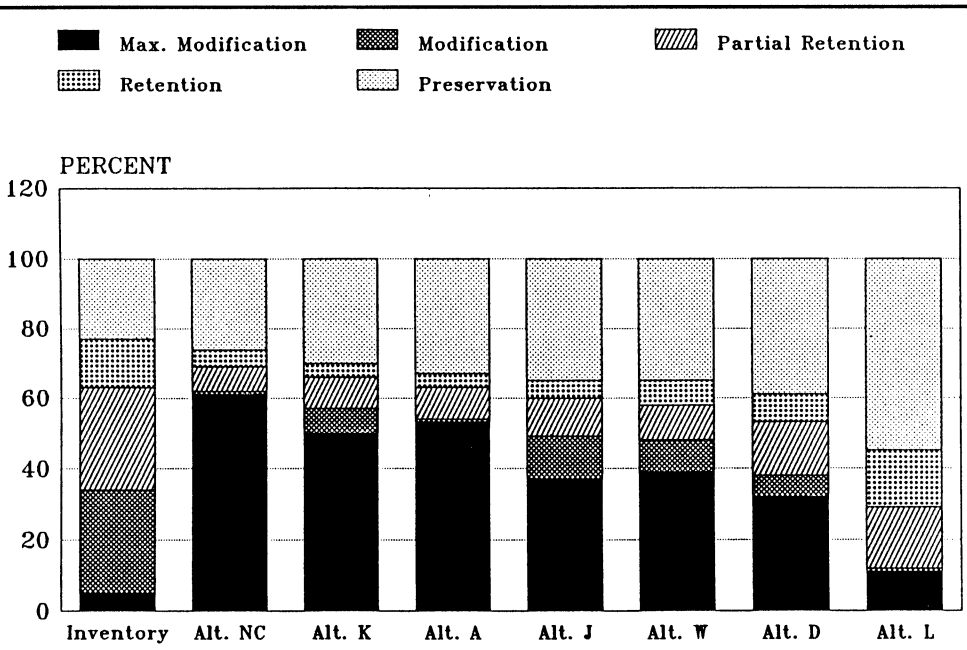
Minerals and energy development activities have the potential to affect scenery to a greater extent than the combined effects of timber harvest and road construction. In addition to tree removal and road construction, minerals or energy development could include significant landform alteration. Effects would also occur from the presence and use of drilling and processing equipment and related facilities. The actual effect of minerals and energy development is unknown however, and can only be determined once a mineral development project is proposed.

The effect of recreation site construction on scenery is minimal except for ski areas. The removal of trees for downhill ski runs, base facilities and structures, and access roads can have the visual effect of several large harvest units. However these effects can be minimized through skillful planning and facility design (USDA Forest Service Agricultural Handbook No. 617, 1984). The visual effects of management activities are most pronounced in landscapes with a homogeneous appearing forest canopy, steep slopes, and light colored soils.

The alternatives have varying effects on scenic quality as a result of the type and distribution of the proposed management areas and their associated activities. In general, alternatives emphasizing the production of market goods provide less Forest area managed for high levels of scenic quality. Areas inventoried as retention and partial retention, which are proposed for management as modification and maximum modification objectives, would change dramatically in appearance. Management activities that result in landform and vegetation alterations would change the scenic quality of these areas from natural appearing to moderately and heavily altered landscapes. The middle ground areas within major viewsheds are the areas most sensitive to this effect, as they are typically inventoried as partial retention.

Table IV-28 provides a Forest-wide comparison of alternatives and their effect on scenery as measured against inventoried VQOs. As illustrated, there would be an increase in the amount of area managed for preservation as a consequence of implementing any of the proposed alternatives. However, lands to be managed for retention, partial retention, and modification VQOs would decrease from inventory levels in all alternatives except Alternative L, in which lands managed for a Retention VQO would increase 2% over inventory levels. The amount of Forest land proposed to be managed as maximum modification in all the alternatives is between 2 and 12 times greater than currently inventoried as maximum modification.

Table IV-28. Forest-wide Effects on Inventoried Visual Quality Objectives



Visual Resource Inventory			Alternatives [1]						
Objectives	Acres	Percent	NC	K	A	J	W	D	L
Preservation	389,486	23	26	30	33	35	35	39	55
Retention	232,262	14	5	4	4	5	7	8	16
Partial Retention	488,649	29	7	9	9	11	10	15	17
Modification	484,170	29	1	7	1	12	9	6	1
Maximum Modification	80,841	5	61	50	53	37	39	32	11
TOTAL	1,675,408	100	100	100	100	100	100	100	100

[1]Expressed as percent of Inventoried Visual Quality Objective acres.

Alternatives L and D propose management of most viewshed middlegrounds as retention and partial retention while Alternatives NC, K, and A, propose management of most viewshed middlegrounds for modification and maximum modification visual quality. Alternatives J and W (PA) propose management of viewshed middleground areas primarily for modification and partial retention objectives.
Table IV-29 illustrates the changes in visual quality proposed by the alternatives for each viewshed.

Table IV-29. Visual Quality Changes for Viewshed and Nonviewshed Areas

		Alternatives						
Viewshed Acres	**Inventory Acres**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Little North Santiam								
Preservation	0.0	2.8	3.1	3.2	3.3	3.4	8.8	3.9
Retention	5.7	1.9	0.0	1.9	0.0	2.2	1.3	6.0
Partial Retention	6.1	1.9	0.6	2.1	2.5	0.8	0.5	2.1
Modification	0.3	0.1	2.1	0.1	5.8	3.9	1.2	0.1
Maximum Modification	0.0	5.3	6.3	4.8	0.4	1.8	0.3	0.0
Breitenbush								
Preservation	0.0	0.2	3.7	3.3	3.4	3.6	4.5	9.7
Retention	15.4	0.2	0.1	0.2	3.6	2.9	9.3	9.2
Partial Retention	15.1	3.7	1.6	4.0	3.7	6.1	3.6	13.0
Modification	1.6	0.2	2.1	0.2	16.9	9.3	14.5	0.2
Maximum Modification	0.0	27.8	24.6	24.5	4.5	10.4	0.2	0.2
North Santiam								
Preservation	0.0	0.1	5.2	5.3	5.5	5.5	6.8	12.6
Retention	24.8	7.7	10.8	7.3	9.0	7.7	13.4	23.1
Partial Retention	23.7	4.3	2.0	5.1	8.9	16.6	30.5	6.4
Modification	2.1	0.7	33.2	0.7	28.2	15.3	0.7	0.6
Maximum Modification	1.1	38.8	0.6	33.4	2.0	6.7	0.4	11.3
South Santiam								
Preservation	0.1	5.6	4.8	8.9	15.9	15.9	19.2	23.9
Retention	14.1	5.9	4.6	4.5	5.5	5.5	9.4	5.4
Partial Retention	21.0	0.1	2.9	1.1	3.6	4.06	10.3	4.2
Modification	9.3	.1	28.4	.1	16.2	16.1	4.5	.1
Maximum Modification	0.1	32.9	3.9	30.0	3.4	3.1	1.1	10.9
McKenzie								
Preservation	0.4	1.7	9.9	10.3	19.2	17.8	35.0	45.5
Retention	38.2	27.2	19.1	24.2	20.7	24.0	18.2	31.8
Partial Retention	37.4	30.6	33.5	29.8	29.0	24.7	25.8	27.7
Modification	9.1	0.7	7.1	0.7	6.0	5.4	3.8	0.7
Maximum Modification	6.6	31.4	21.9	26.8	16.6	19.7	8.8	3.9
North Fork/South Fork								
Preservation	0.0	6.2	7.7	13.7	18.3	18.2	14.8	33.1
Retention	34.2	7.0	1.3	6.5	4.8	10.1	10.8	16.7
Partial Retention	29.1	12.7	11.7	14.1	15.4	9.7	24.0	30.6
Modification	14.0	0.1	6.9	0.1	40.0	34.7	28.5	0.1
Maximum Modification	3.2	54.4	52.9	46.2	2.0	7.7	2.4	.0.0
Fall Creek								
Preservation	0.0	0.1	3.9	4.0	7.9	6.8	4.3	14.2
Retention	2.5	5.2	0.0	3.0	0.1	0.4	2.2	6.2
Partial Retention	6.9	0.2	2.1	1.6	5.9	7.4	7.7	10.4
Modification	21.4	0.1	2.0	0.1	16.8	.0.1	16.3	0.1
Maximum Modification	0.0	25.3	22.8	22.1	0.1	16.1	0.2	0.0

Table IV-29 Cont. Visual Quality Changes for Viewshed and Nonviewshed Areas

		Alternatives						
Viewshed Acres	**Inventory Acres**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Willamette								
Preservation	0.0	2.7	12.6	14.4	18.1	19.4	23.1	48.9
Retention	27.5	19.9	14.9	18.0	15.1	14.5	13.7	27.5
Partial Retention	53.3	13.4	26.7	13.6	23.0	25.0	51.5	11.8
Modification	15.5	2.0	25.7	2.0	35.0	19.9	2.6	2.0
Maximum Modification	0.0	58.3	16.3	48.2	4.9	17.4	5.3	6.8
Waldo								
Preservation	0.5	20.3	1.8	20.3	17.5	16.8	17.5	26.5
Retention	17.7	6.3	4.2	0.0	2.9	9.7	9.0	0.0
Partial Retention	8.4	0.0	20.6	6.4	6.3	0.1	0.1	0.1
Modification	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Maximum Modification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Fork								
Preservation	0.0	0.2	7.9	7.8	8.5	8.7	12.1	24.7
Retention	0.1	0.0	2.2	0.0	8.9	8.9	14.7	18.5
Partial Retention	25.4	12.4	3.6	14.2	16.3	17.5	12.4	13.1
Modification	35.6	0.1	10.7	0.1	20.6	16.7	25.4	0.1
Maximum Modification	7.1	56.5	44.9	47.0	14.9	17.4	4.6	13.6
Non-Viewshed Areas								
Preservation	388.6	398.2	443.2	456.4	468.8	475.1	501.6	669.8
Retention	52.1	13.5	14.8	12.5	19.8	32.9	40.0	138.7
Partial Retention	261.3	28.5	42.1	58.3	63.0	59.8	79.3	167.1
Modification	375.2	0.4	5.2	0.4	20.6	21.8	10.8	0.4
Maximum Modification	62.8	699.3	634.6	612.4	567.7	550.4	508.2	164.0

The amount of area assigned to each VQO in each viewshed has a major effect on the future visual condition. If the amount of area assigned to preservation, retention, and partial retention VQOs in a viewshed is increased over current amounts, particularly in middleground areas, it is likely that the EVC would be maintained or improved in the viewshed over the long-term. However, if acreages assigned to these VQOs remain the same or decrease from current levels, the scenic quality of a viewshed is expected to become more altered in appearance in the near-future (10-20 years).

The proposed VQO changes of the alternatives, as illustrated in Tables IV-28 and 29, would have the effect of altering the existing visual condition of Forest viewsheds. Based on EVC ratings; the amount of area assigned to each VQO; the distribution of each management area in relation to important travel routes, use areas and sites; and the rate of programmed harvest associated with each management area the expected future visual condition of each viewshed is determined. Table IV-30 summarizes the effect of each alternative on the scenery of each Forest viewshed.

Table IV-30. Expected Changes to Existing Visual Conditions of Forest Viewsheds

Existing Visual Condition			Alternatives						
Viewshed	Acres [1]	EVC Rating [2]	NC	K	A	J	W	D	L
Little North Santiam	12,222	1	3	4	3	3	2	1	1
Breitenbush	32,357	4	4	4	4	4	3	2	2
North Santiam	63,926	3	4	4	4	3	2	1	2
South Santiam	53,006	2	4	4	4	2	2	1	2
McKenzie	103,131	3	3	3	3	2	2	1	1
North Fork/South Fork	81,033	2	4	4	4	3	3	2	1
Fall Creek	30,929	1	4	4	4	2	3	2	1
Willamette	102,747	3	4	3	4	3	3	1	1
Waldo	26,706	1	1	3	1	1	1	1	1
Middle Fork	83,250	3	4	4	4	3	3	2	1

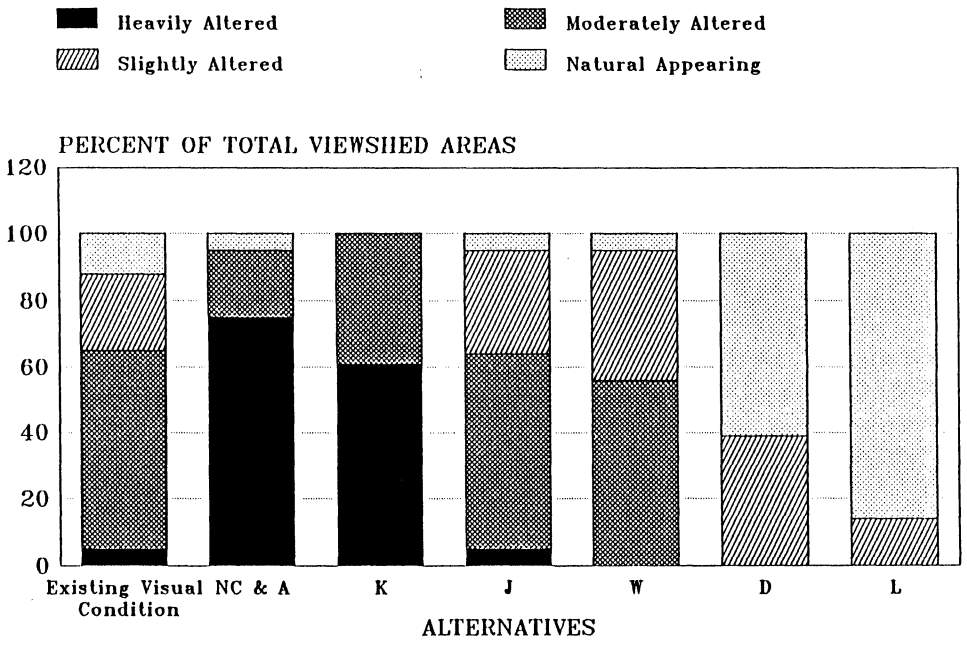
[1] Acreages include non-National Forest land.
[2] 1 = Natural Appearing.
2 = Slightly Altered.
3 = Moderately Altered.
4 = Heavily Altered.

In Alternative D and L the existing visual conditions of all viewsheds would be maintained or improved with one exception. The Fall Creek viewshed would become slightly altered in Alternative D.

Alternative W (PA) maintains or improves the EVC, and hence, the natural appearance of all but two viewsheds. In Alternative W (PA) both the Little North Santiam and the Fall Creek viewsheds would change from natural appearing to slightly altered conditions. Alternative J also maintains or improves conditions of most viewsheds. This Alternative maintains the EVC of six viewsheds and proposes to improve conditons of the McKenzie viewshed. The EVC of the Little North Santiam, Fall Creek and Willamette viewsheds would become altered under this alternative.

In Alternatives NC, K and A, existing visual conditions of Forest viewsheds are expected to diminish. All viewsheds in these alternatives, except one, would remain or become moderately or heavily altered. The Fall Creek viewshed in Alternative NC and A would be maintained in a natural appearing condition. The generalized effect of the alternatives on the Forest's existing visual condition is summarized in Figure IV-17.

Figure IV-17. Expected Changes to Visual Conditions of Forest Viewsheds



Existing Visual Condition			Alternatives [1]						
Condition Class	**Acres**	**Percent**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Natural Appearing	69,857	12	5	0	5	5	5	61	86
Slightly Altered	134,039	23	0	0	0	31	39	39	14
Moderately Altered	353,054	60	20	39	20	59	56	0	0
Heavily Altered	32,357	5	75	61	75	5	0	0	0
VIEWSHED TOTALS	589,307	100	100	100	100	100	100	100	100

[1] Alternative values are in percent of total viewshed acres

Cumulative Effects on Scenery

While a single activity may only affect its immediate surroundings, many activities over several years or decades would affect the scenic quality of the Forest as illustrated in Figure IV-17. This effect has even greater consequence in areas where private or other public agency land is adjacent to the Forest. Areas with large blocks of intermingled ownership may display these effects most significantly. It is assumed that private landowners having a large timber inventory will harvest timber and will not maintain the landscape in a natural appearing condition. These areas within and adjacent to National Forest lands will be seen from some travel routes, recreation roads and trails, high vista points, and from aircraft. This "checkerboard" effect will be most apparent in the North Santiam, South Santiam, and Middle Fork of the Willamette drainages and to a lesser extent in the McKenzie drainage and around the community of Oakridge.

Alternatives NC, K and A would have long-term cumulative effects of altering viewsheds at a rapid rate due to the amount of land allocated to general forest and associated harvest levels. The NC Alternative would have a more dramatic effect than K or A on viewshed conditions. This alternative makes available more acres of the general forest in viewshed areas and proposes their harvest at an increased rate. Alternatives J and W (PA) would also result in long-term effects to the appearance of Forest viewsheds. The most significant effect would occur from shifts in EVCs to expected future conditions of some viewsheds. Generally, Alternative J would maintain or improve the existing condition of most viewsheds and lower conditions of a some others. Alternative W (PA) would improve conditions of appearance for four viewsheds, maintain conditions of four, and lower conditions of two others.

Alternatives D and L would have the least cumulative effect on the scenery as these alternatives emphasize the maintenance or improvement of scenic quality within all viewsheds of major travel corridors.

Mitigation Measures for Scenery

The appearance of the landscape will change as management activities are implemented to fulfill Forest Plan objectives. Several published visual resource handbook guides, such as "National Forest Landscape Management, Volumes 1 and 2", specify mitigation methods for scenery, many of which are included in the standards and guidelines of the Forest Plan.

In scenic viewshed corridors, timber harvest areas will be shaped to blend with the terrain to minimize contrast with the character of the existing landscape. Roads will be seeded along steep cutbanks and screened by vegetation. Along critical roads, trails, streams, lakes, and dispersed sites timber harvest units may be restricted in size. In selected management areas, the latitude of vegetative management activities is restricted. For example, harvest levels may be reduced, or complex logging systems and/or stringent cleanup procedures may be required to achieve scenic objectives.

Recreational settings in particular are managed with visual objectives that reflect the concerns of recreational users and expected levels of recreation use. Dispersed camping areas are to be set back from lakes, streams, trails and key interest features to disperse the effects of recreational activity. Developed sites have the potential to contrast dramatically with their surroundings; these potential contrasts are partially mitigated through the use of professional site planning and landscape design skills as well as through the use of native or natural appearing materials and use of "earth tone color" paints and stains. Vegetative screens and/or dispersed or buried facilities may provide adequate mitigation, though in some cases, visual constraints could eliminate certain types of developed site construction.

Relationships With Other Agency Plans or Policies for Scenery

In some viewsheds there may be differences between the Forest Service objectives and those of adjacent landowners or other land management agencies, such as the State of Oregon and Bureau of Land Management. The Forest coordinates with a number of other agencies to ensure that visual resource quality is maintained along state and federal highways, around reservoirs, and around utility lines and electronics sites. To identify potential conflicts and further coordination between other agencies and the Forest Service, a number of operation and maintenance plans are reviewed, including those of the Army Corps of Engineers, Eugene Water and Electric Board, Bonneville Power Administration, the State Department of Transportation, and the Oregon Department of Fish and Wildlife. County zoning actions and adjustments would also be reviewed during project planning.

Incomplete and Unavailable Information

Inventories used in scenic resource management are in need of updating to incorporate the most recent research on human perception and scenic quality expectations of Forest visitors.

Digital terrain data of the Forest landscape is needed for use in visual simulations of proposed landscape altering activities.

Environmental Consequences Of The Alternatives On Wild And Scenic Rivers

The Wild and Scenic Rivers Act of 1968 (Public Law 90-542 as amended) established a method for providing federal protection for certian of our remaining free-flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benifit from protective management and control of development for which the Act provides.

Numerous river corridors in the Forest draw increasing numbers of users annually because of their special attributes and some have gained both State-wide and National attention. At this time there are 2 designated National Wild and Scenic Rivers, 2 designated Wild and Scenic Study Rivers, and 4 designated State Scenic Waterways within the Forest. The McKenzie River and the North Fork of the Middle Fork of the Willamette River are designated as included in the National System and Blue River and the South Fork of the McKenzie are designated as Study Rivers. Rivers designated as State Scenic Waterways include: Little North Santiam; McKenzie, South Fork of the McKenzie; and North Fork of the Middle Fork of the Willamette Rivers. In addition, all or portions of 8 rivers on the Forest have been determined eligible for Wild and Scenic River status. Table IV-31 displays the designation status of Forest rivers. A discussion of each river listed in Table IV-31 is included in Appendix E together with a tabular listing of river mileage, corridor acres, "outstandingly remarkable" values and potential river classification.

Direct and Indirect Effects of the Alternatives on Wild and Scenic Rivers

The setting of a wild and scenic river provides for a wide range of recreational opportunities which are enhanced by the river's free-flowing condition and "outstandingly remarkable" values and the quality of its surrounding environment. Activities that could affect river values include timber harvest, road and bridge construction, prospecting and mineral extraction, geothermal development, expansion of hydroelectric generating facilities, and development of private land in the area. Environmental changes in river corridors resulting frome these activities could limit a rivers future consideration for inclusion into the National Wild and Scenic Rivers system.

The location and extent of the effects of the alternatives on eligible and designated study river values is relative to the particular management area(s) applied to river corridors. Management areas that emphasize timber harvest, provide for road construction, permit mineral extraction, and allow for hydroelectric or geothermal development have a high probability of altering potential WSR values. Management areas that limit road development, timber harvest rates, and adjust harvest unit designs commensurate with a high level of scenic quality (retention VQO), will typically maintain resource values of river corridors consistent with Scenic or Recreation river classifications. Management areas that prohibit timber harvest and all development, except for low impact recreational facilities, are expected to preserve potential WSR environments in their current condition.

Table IV-31. Designation Status of Forest Rivers[1]

River Name	National WSR	State Scenic Waterway	National WSR Study River	Eligible Rivers
Little North Santiam River		X		X
South Fork Breitenbush River				X
Breitenbush River				X
North Santiam River				X
Quartzville Creek				X
Middle Santiam River				X
South Santiam River				X
McKenzie River	X	X		
Blue River			X	
South Fork McKenzie River		X	X	
NF of the MF Willamette River	X	X		
Middle Fork Willamette River				X

[1]See also Appendix E for a disscussion of each river and a display of corridor acreage, river mileage, river values, and potential classification.

Although none of the alternatives recommend that Congress designate additional Forest rivers as included into the National Wild and Scenic Rivers system, all alternatives, execpt the NC Alternative, specify measures to preserve free-flowing conditions, and protect "outstandingly remarkable" scenic, recreational, geologic, fish, wildlife, historical/cultural, biological and ecological values of all designated, study and eligible rivers. Protection of these rivers and their associated values is extended until a river is determined un-suitable for inclusion into the National System.

Through interim protection of these river values potential WSR corridors would be managed to provide opportunities for a broad range of river oriented recreation activities, such as boating, rafting, fishing, hiking and camping. Other activities, including road construction or timber harvest, would be permitted with these corridors providing that such activities would not lower a rivers potential WSR classification or affect it's eligibility for inclusion into the National System.

Alternative NC is the only alternative that fails to protect the free-flowing conditions and the "outstandingly remarkable" values of eligible rivers in the Forest from development activities. Eligible rivers in this alternative are protected to the extent that scenic management areas overlay these potential WSR corridors as well as through the application of riparian management standards. Protection from road construction, mineral extraction or hydroelectric development consistent with potential WSR classifications is not, however afforded in this alternative. This alternative does however provide protection of designated WSRs and study rivers in accord with the requirements of the Wild and Scenic Rivers Act. Table IV-32 provides a summary of the amount and extent of designated, study and eligible rivers corridors to be protected in each alternative.

Table IV-32 Wild and Scenic River Protection Status

		Alternatives						
River Designation[1]	**Units**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Wild and Scenic Rivers	Rivers	2	2	2	2	2	2	2
	Miles	55.0	55.0	55.0	55.0	55.0	55.0	55.0
	Acres	17,459	17,459	17,459	17,459	17,459	17,459	17,459
W & S Study Rivers	Rivers	2	2	2	2	2	2	2
	Miles	34.2	34.2	34.2	34.2	34.2	34.2	34.2
	Acres	10,944	10,944	10,944	10,944	10,944	10,944	10,944
Eligible for W & S Status	Rivers	0	8	8	8	8	8	8
	Miles	0	122.2	122.2	122.2	122.2	122.2	122.2
	Acres	0	41,927	41,927	41,927	41,927	41,927	41,927
TOTALS	Rivers	4	12	12	12	12	12	12
	Miles	89.2	211.4	211.4	211.4	211.4	211.4	211.4
	Acres	28,403	70,330	70,330	70,330	70,330	70,330	70,330

[1] The Little North Santiam River, McKenzie River, South Fork of the McKenzie River, and the North Fork of the Middle Fork of the Willamette River are also designated as State Scenic Waterways.

In all alternatives, however to a lesser extent in NC the all river corridors will retain the appearance of an old-growth forest through the limiting the size of created openings, extending harvest rotation lengths, and use of uneven-aged havest systems when vegetation management activities are undretaken.

Campsites within these river corridors would remain accessible from existing public roads and other improvements with these corridors, such as signing and parking areas, when planned would be designed to enhance user experience and protect resources in accordance with the requirements of the Wild and Scenic River Act. Construction of dams and development of a river's hydroelectric potential would not be permitted in any alternative, except the NC Alternative. This protection would be extended until a river has been determined unsitable for WSR status.

Cumulative Effects on Wild and Scenic Rivers

As natural settings are altered, the capacity of the Forest to provide wild and scenic river settings would be diminished. Although demand for recreation river experiences may increase, opportunities to protect river values consistent with Wild and Scenic River classification will be forgone or limited.

Mitigation Measures for Wild and Scenic Rivers

The designation of eligible or study rivers as included into the National Wild and Scenic Rivers System has the potential to increase levels of recreation use and subsequent effects on river environments. Historical data from the Rogue Wild and Scenic River display this trend (RIM, Rogue River National Forest, 1970-1985). To prevent degradation of resources and maintain the quality of recreation experiences, standards and guidelines provide for the establishment of carrying capacities for managing use levels and mitigating effects. The effects of crowding on campsites and trail systems can be reduced

by substituting facilities and dispersing recreation use. Access to river corridors, provided by the construction and maintenance of signs and trails, will govern the location and degree of effects to these areas from public use.

Some management practices can be employed to ensure that effects of vegetation manipulation remains subordinate to the general scene of the area. These practices include: adjustments in the size and location of timber harvest units and created openings; the regulation of harvest rates; the use of uneven-aged management practices, such as group selection or individual tree selection; handpiling and burning of harvest debris; immediate reforestation of disturbed sites; and locating roads to be visually inconspicuous from the river surface and riverbanks.

Relationships with Other Agency Plans or Policies for Wild and Scenic Rivers

Designation of eligible or study rivers as included into the National Wild and Scenic Rivers system could affect private land use and development. Effects would include compliance with county zoning regulations as well as stipulations of scenic easements. Stipulation may limit vegetation management practices, and establish requirements regarding maintenance and development of private lands. Geothermal resource use and development on private land could be subject to additional constraints similar to those constraining geothermal development on public land.

The current objectives of the Oregon State Scenic Waterways System are not in conflict with the effects of any of the proposed Alternatives. Four rivers in the Forest, the Little North Fork of the North Santiam, the McKenzie, the South Fork of the McKenzie, and the North Fork of the Middle Fork of the Willamette River and Waldo Lake are included in the Oregon State Scenic Waterways System. Their important features of these rivers, such as, water purity, natural trout populations, and plant and animal diversity will continue to be protected through the application of standards and guidelines specified in the Forest Plan. Continuing coordination with the Oregon State Parks Division and the Oregon State Marine Board will be conducted to assure compliance with State regulations for access, use and management of designated rivers. In addition, cooperative efforts will continue with these agencies of the State as participants in suitability studies of eligible and designated study rivers and in the development of river management plans for designated Wild and Scenic Rivers on the Forest.

Inadequate Information

All essential information was available for assessing WSR eligibility of Forest rivers.

Environmental Consequences Of The Alternatives On Roadless Lands

Roadless lands are defined as inventoried areas of undeveloped Federal land within which there are no improved roads maintained for travel by motorized vehicles intended for highway use. The roadless area inventory does not include the Oregon Cascades Recreation Area (OCRA), established Wilderness, or areas non-contiguous to Wilderness that are less than 5,000 acres in size. Due to these existing areas, there will always be, as a minimum, 23% of the Forest in a roadless condition.

The Forest, prior to release of the DEIS, and following passage of the Oregon Wilderness Act of 1984, had 31 inventoried roadless areas that totaled 210,207 acres. During the period 1984-1987 and the period following release of the DEIS (1987-1989), management activities were being implemented in many of these areas. A recent assessment of inventoried roadless area conditions indicates that 38,200 acres have been affected by management activities since the 1984 inventory was completed. The roadless area inventory currently includes 31 areas that total 172,007 acres in parcels that are at least 5,000 acres in size, except where contiguous to established Wilderness, smaller areas are included. The disposition of these lands has become an important public issue.

In the current planning cycle, these roadless lands are available for a range of multiple resource uses including those of timber production, fish and wildlife habitat, research, recreation, and in one instance Wilderness. The timber on roadless lands has a commodity value and has the potential to contribute to both the economic and social pattern of local communities. Roadless lands also have the potential to provide settings for recreation, and opportunities to interweave the physical environment with particular social factors such as isolation, remoteness, and personal challenge.

An important consequence of the alternatives is whether or not these lands will remain in an unroaded condition, and whether they will meet the minimum requirements for future Wilderness consideration by Congress. Allocation of roadless areas to some uses requires development. These uses include timber harvest, road construction, and special uses such as expansion of existing ski areas and mining exploration. Development activities may affect how people perceive environmental qualities such as naturalness and isolation.

Roadless land is also proposed for some uses which require only partial development. These would include areas allocated to retention and partial retention visual quality objectives, and semiprimitive motorized and nonmotorized recreation areas that permit timber harvest. In these areas, there will be a slower rate of change, and effects will be managed to shorten the time of recovery to natural appearing conditions. In some cases, roadless conditions can also be re-created by limiting the kind of management activities allowed in an area and letting it revert, in time, to a condition where roads and other past alterations are apparent.

Direct and Indirect Effects of the Alternatives on Roadless Lands

As a consequence of implementing any of the proposed alternatives, there would be effects to roadless lands in the Forest. In all alternatives some roadless areas would become developed through road construction, timber harvest, recreation facility development, or mineral exploration and development, while other areas would remain in an undeveloped condition. The extent of development or maintenance of an undeveloped condition of roadless lands is determined by the type of use to which areas are allocated.

Alternatives that favor development of most roadless areas (Alternatives NC, K, A, J, and W (PA)) would diminish the Forest's capacity to satisfy future demand for uses dependent on roadless conditions.

In addition, the option to evaluate roadless lands for Wilderness in the next cycle of Forest planning would be limited. The allocation of roadless lands to development activities typically results in alteration of the landscape, vegetation patterns, and size and shape of individual areas. Changes of this nature limit the potential of an area to provide isolation, solitude, and primitive recreation experiences and hence its suitability for future Wilderness evaluation.

Although development of roadless areas would preclude future Wilderness evaluation and other recreation uses, it would provide for other values and benefits. Development of roadless areas would support maintenance of historic harvest levels, employment of wood products workers, and community stability. In addition, development activities would provide increased forage for big-game animals and habitat for other species.

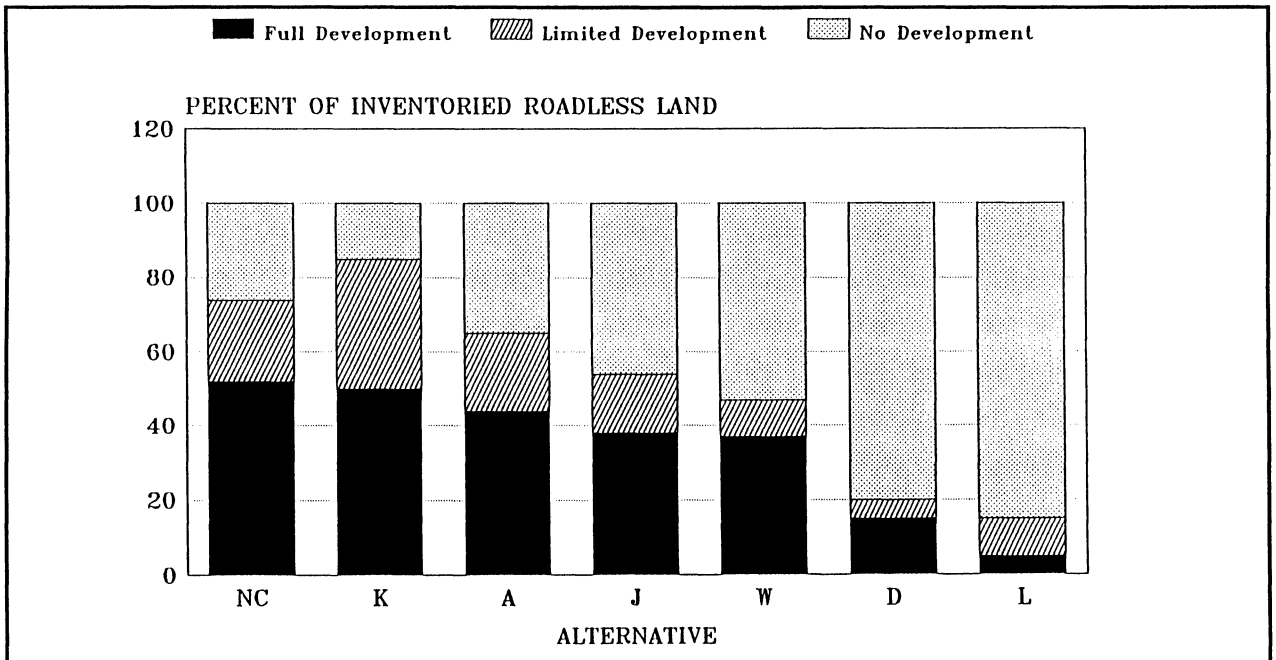
In alternatives that maintain significant portions of most roadless areas (Alternatives D and L), it is likely that greater amounts of future demand for uses dependent on roadless conditions such as semiprimitive recreation could be satisfied. In these alternatives, and to a lesser extent in Alternatives J and W (PA) the Wilderness evaluation option would be retained for many areas for the next cycle of Forest planning. Opportunities for isolation, solitude, and primitive recreation would be maintained in some inventoried roadless areas.

The allocation of roadless areas to uses that do not permit the extraction or removal of priced commodities, such as wood products and minerals, can affect the economic base and social patterns of dependent communities. Employment levels of wood products workers would likely be affected. However, habitats for some wildlife species would be favored, such as species utilizing mature and old-growth timber habitat.

The location and magnitude of these effects are relative to the amount of total roadless land allocated to full development, limited development or no development. As indicated by Table IV-33, Alternatives D and L would maintain between 80 and 85% of all inventoried roadless land respectively in an undeveloped condition while Alternative K maintains 15%. Alternatives NC, A, J, and W (PA) would maintain between 26% and 53% of the Forests roadless land in an undeveloped condition.

As indicated in Table IV-33, Alternative L is the only alternative that recommends the inclusion of roadless land in the National Wilderness Preservation System; Alternative L proposes the study and designation of 169,360 acres of roadless land, including the 6,292 acre Mt. Hagan area, as Wilderness.

Table IV-33. Effects on Roadless Lands [1]



	Alternatives [1]						
Effect Categories	**NC [2]**	**K**	**A**	**J**	**W**	**D**	**L**
Full Development	52	50	44	38	37	15	5
Limited Development	22	35	21	16	10	5	10
No Development	26	15	35	46	53	80	85
TOTAL	100	100	100	100	100	100	100

[1] Values are percent of inventoried roadless land
[2] Includes 6,292 acres of proposed Wilderness.

Table IV-34 displays, by alternative, the amount of each roadless area that would be allocated to an undeveloped condition over the long term. Refer to Appendix C for a detailed description of the development effects of the alternatives on each roadless area.

Table IV-34. Percent of Roadless Land Retained in an Undeveloped Condition

	Alternatives							
Roadless Area	**Acres**	**NC [1]**	**K**	**A**	**J**	**W**	**D**	**L**
Bull of the Woods	6,375	65	76	75	95	94	94	56
Opal Creek	10,687	3	10	11	10	16	44	78
Elkhorn	8,958	0	15	15	15	20	99	39
Mt. Jefferson North	6,036	1	15	11	15	18	75	78
Mt. Jefferson South	4,991	1	36	28	33	34	80	98
Middle Santiam	6,783	0	3	3	3	7	59	91
Echo Mountain	7,551	68	7	70	84	81	98	99
Moose Lake	4,778	0	25	25	25	28	27	69
Menagerie (Rooster Rock)	405	0	0	0	0	5	0	16
Gordon Meadows	8,361	0	5	2	32	44	96	94
Mt. Washington North	1,003	2	15	2	21	21	100	96
Mt. Washington West	6,676	1	2	3	12	15	97	49
Mt. Washington South	4,224	3	6	3	89	90	100	100
Huckleberry	853	100	93	100	100	100	100	100
Frog Camp	469	100	0	0	100	100	100	100
Gold Creek	1,045	2	16	16	29	33	78	98
Rainbow Falls	43	0	0	0	0	0	0	0
Mosquito Creek	406	5	0	5	0	11	0	74
French Pete [1]	2,581	1	9	13	72	79	98	36
Roaring River	2,048	0	0	0	10	9	9	82
Mt. Hagan [2]	6,292	12	21	33	39	42	99	75
McLennen Mountain	7,807	8	21	21	21	23	49	83
Chucksney Mountain	15,507	59	9	66	68	70	83	89
Waldo Lake [1]	31,889	31	6	35	50	72	88	96
Cornpatch	6,762	0	22	22	22	46	26	90
Charlton Butte	2,880	100	41	100	100	100	100	100
Maiden Peak	11,070	100	8	100	100	100	100	100
Hardesty Mountain	3,690	1	27	27	66	71	83	99
Bulldog Rock	555	50	27	50	100	100	100	100
Diamond Peak North	1,130	2	19	17	40	58	81	96
Diamond Peak South	149	0	0	0	0	100	100	71
Total All Areas-Acres and %	172,007	26	15	35	46	53	80	85

[1]This area is divided into several parts for purposes of description in Appendix C.
[2]The Mt. Hagan area is recommended for Wildernes in Alternative L.

Cumulative Effects on Roadless Lands

The cumulative effect on roadless lands is relative to the extent of their development in the alternatives from both the activities on the Forest and those of adjacent land owners. Each alternative proposes different levels of development for different amounts of the inventoried roadless areas. The proposed development of areas, whether full or limited would alter the roadless condition of each area gradually through time. As roads are constructed and timber sale units are harvested, roadless areas would be altered in size and shape. In addition roadless areas adjacent to other land ownerships are subject to the external influences of their management. These effects would alter the potential of individual areas to provide wilderness quality experiences and opportunities in the future.

Areas of 5,000 acres or larger, maintained in an undeveloped condition, would be available for consideration as Wilderness in the next cycle of land management planning. Roadless lands that are allocated to limited development uses would be developed 30-50% slower than areas to be fully developed. This slower rate of development could maintain the current roadless condition of some areas depending on: access strategies, such as helicopter or other aerial harvest systems; project location and design; and implementation schedules. Areas included in the full development category are not expected to remain roadless much beyond 2010.

Mitigation Measures for Roadless Lands

On roadless land proposed for limited development, there will be a slower rate of change than on intensively managed lands, and impacts can be managed to shorten the time of recovery to natural conditions. Where roadless lands have been allocated to scenic uses, timber harvest is reduced to 5-7% of the area per decade. Cutting units will be designed to reflect the vegetative patterns of the characteristic landscape. Three major methods of mitigating effects to roadless lands are: the allocation lands to non-development uses; the use of aerial harvest systems without the construction of roads; and a general development strategy that limits harvest access and activities to the perimeter of individual areas where feasible.

Relationship With Other Agency Plans or Policies for Roadless Lands

There are no conflicts with the proposed allocation of roadless lands in the alternatives with the plans or policies of other agencies.

Incomplete or Unavailable Information

Detailed location and extent of scheduled road construction and timber harvest for the period 1991 through 2000.

Environmental Consequences Of The Alternatives On Wilderness

The environmental qualities of naturalness and solitude will continue to characterize designated Wilderness, although as a consequence of implementing any of the proposed alternatives there will be change, within acceptable levels, in some aspects of Wilderness settings. Wilderness will continue to provide a range of recreation opportunities that interweave the physical and biological features of water, air, soil, geology, vegetation, fish and wildlife with particular social factors such as isolation, remoteness and personal challenge.

The Wilderness Act of 1964 states that Wilderness is to be managed in such a manner "devoted to the public purposes of recreational, scenic, scientific, educational, conservation and historical use" only to the extent that the essential wilderness character of the area is protected. Managers are faced, therefore, with the problem of accommodating human use yet preserving an area's wilderness quality.

Given that any use of the environment produces at least some impact, managers must identify where, and to what extent, varying degrees of change are appropriate and acceptable within wilderness settings. This is accomplished through the use of the Wilderness Resource Spectrum (WRS) system. Wilderness settings are characterized within the WRS as Pristine, Primitive, Semiprimitive and Transition classes. For a description of WRS classes refer to Chapter III, Wilderness.

Changes in WRS classifications result primarily from resource conditions affected by the amount and type of user activities and the inside of designated Wilderness. Although activities, such as timber harvest, can cause localized effects near wilderness boundaries, the most significant effects on wilderness settings are relative to access and the amount and type of recreation use that a particular area receives.

Roads provide access to wilderness settings, and trails facilitate and organize recreation use within designated Wilderness. Trails allow people to take advantage of primitive and un-confined types of recreation opportunities. An extensive trail system can result in fewer contacts between users but could cause increased effects to physical and biological aspects of the environment. Increased access can also cause overuse of desirable campsites and attractions. For example, pack and saddle users need water and meadow areas for maintaining their stock, and tend to utilize large campsites. Commercial outfitters and guides may introduce large groups to some wilderness settings, affecting the solitude and isolation of individuals or smaller groups of users.

Each Wilderness within the Forest displays a range of WRS conditions. For example, at major entry points to wilderness, such as Obsidian Trailhead in the Three Sisters Wilderness, use levels are relatively high, with frequent contact between parties. Areas of Wilderness, such as Obsidian Trailhead, would be classified in the Transition WRS class and resource effects would be moderately evident. Elsewhere, within Forest Wildernesses there are places where few people visit and natural conditions remain undisturbed. The Pristine WRS classification would apply to these undisturbed areas. Between these opposing ends of the WRS are the Primitive and Semiprimitive classes, which apply to the intermediate conditions of use and resource quality of wilderness.

Direct and Indirect Effects of the Alternatives on Wilderness

Three factors that vary by alternative with respect to their consequences on Wilderness are: the recommendation of adding acreage to the Wilderness Preservation System; the establishment of WRS management classes and their subsequent projected recreation use; and increased access through road construction and harvest activities along Wilderness boundaries.

Of the proposed alternatives, only Alternative L, recommends lands for Wilderness designation or study. This alternative proposes 169,360 acres of roadless land, including the Mt. Hagan roadless area for study or inclusion in to the National System. This would result in a total of 550,200 acres of Wilderness in this alternative. Congressional legislation would be needed to establish the areas in this alternative as designated Wilderness. A considerable investment of time and money expended on a research project in the Mt. Hagan area would be forgone if the area were designated as Wilderness. In 1981 research personnel began collecting pre-treatment data on channel conditions, vegetation, stream ecosystem, and soil. This pre-treatment data is valuable in establishing a baseline from which to evaluate later treatments. The location of the project is in an undisturbed low elevation drainage near the proposed Hagan Block RNA. The RNA would serve as a control for the treatment area. Undisturbed low elevation areas such as this are not common and this research project would contribute to knowledge of cumulative effects of riparian management.

Designation of WRS classes within each Wilderness allows for management of Wilderness settings for differing experiences and recreation use capacities. The capacity appropriate to each setting is measured by "persons at one time." The capacity to provide for Wilderness use is determined by the amount and distribution of each WRS Class included in each alternative. All of the proposed alternatives provide for Wilderness recreation use within their respective WRS capacities except Alternative NC. Alternative NC does not employ the WRS as a management system. Table IV-35 illustrates the amount of each WRS Class and respective RVD output for the period 1991-2000 provided in each alternative.

Table IV-35. Effects on Wilderness Resource Spectrum Acres and Visitor Days

		Alternatives						
WROS Class	**Units**	**NC [1]**	**K**	**A**	**J**	**W**	**D**	**L**
Primitive Trailed-A	MAcres	--	299.3	299.3	299.3	299.7	299.3	411.2
	MRVDs	--	16.7	16.7	16.7	16.7	16.7	16.7
Primitive Trailed-B	MAcres	--	41.0	41.0	41.4	44.0	67.0	54.9
	MRVDs	--	131.0	131.0	131.0	123.4	131.0	131.0
Semiprimitive	MAcres	--	26.0	26.0	36.7	35.0	14.5	81.8
	MRVDs	--	138.4	138.4	195.7	155.9	59.5	199.8
Transition	MAcres	--	14.5	14.5	3.3	2.1	0.0	2.3
	MRVDs	--	66.0	66.0	24.6	22.1	0.0	23.0
TOTAL	MAcres	380.8	380.8	380.8	380.8	380.8	380.8	550.2
	MRVDs	330.7	352.1	352.1	368.0	318.1	207.2	370.5

[1] Wilderness Resource Spectrum Classes are not applicableto the No Change Alternative.

As illustrated in Table IV-35, Alternatives D and L will provide the highest quality Wilderness experiences; Alternative D by virtue of re-allocating inventoried Semiprimitive Class areas to the Primitive Class and the Transition Class areas to the Semiprimitive Class, thus reducing use levels of Wilderness; and Alternative L through the proposed designation of additional Wilderness. In Alternatives K and A WRS Classes are maintained as currently inventoried. In Alternative J management of interior WRS Classes of each Wilderness is re-allocated from Transition to the Semiprimitive Class. In Alternative W(PA), WRS Classes are also adjusted to improve the quality of Wilderness experience to be provided

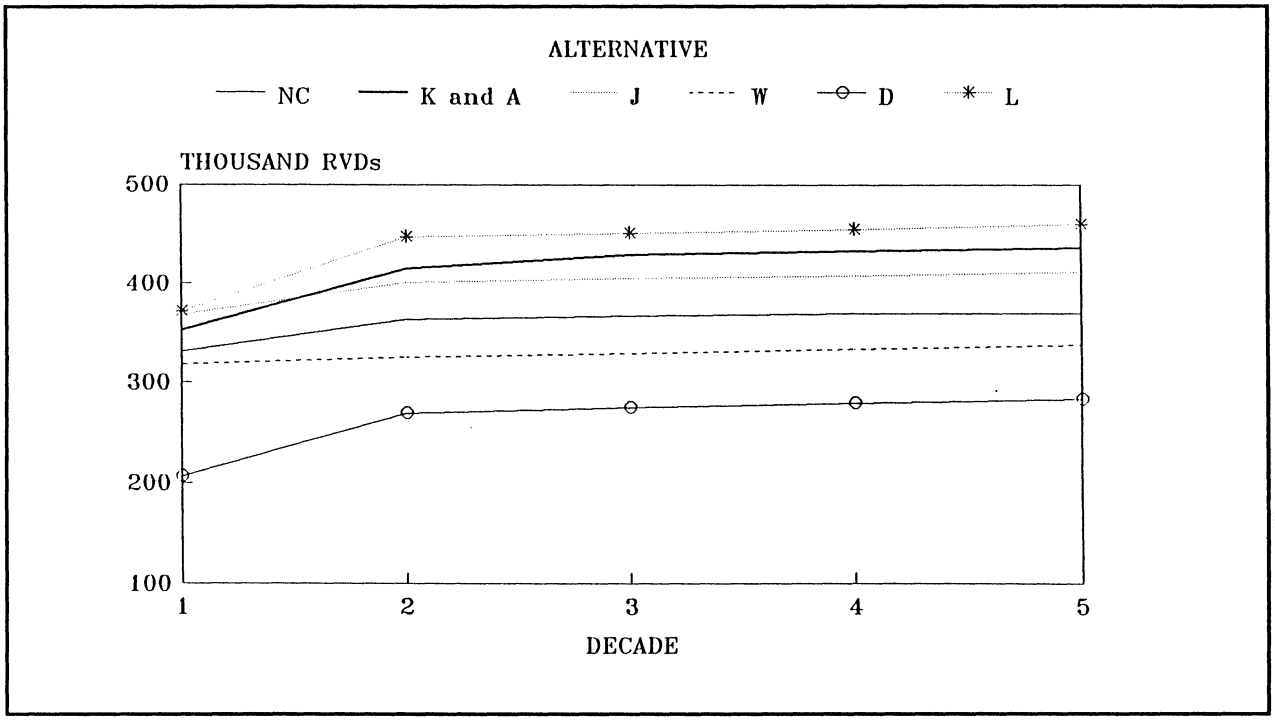
and to enhance the conditions of wilderness resources. In the NC Alternative wilderness use opportunities are un-differentiated by WRS Class.

Each alternative, except the No Change Alternative, provides for a range of Wilderness use opportunities through the distribution of WRS Classes. Total Wilderness use varies among the alternatives over a five decade planning horizon based on the distribution of these WRS classes. Figute IV-18 illustrates the amount of expected Wilderness use by decade for each alternative.

Although Alternatives W, D, and L provide the highest quality Wilderness experience opportunities, they also provide the least amount of use during the planning horizon. These alternatives, through variation in the distribution of WRS acres, propose to alter use levels in Wilderness areas where use has been typically high and where resource conditons fail to comply with limits of acceptable change (LAC). Likely consequences of these alternatives include the displacement of former Wilderness users into nonwilderness areas. The recovery of natural processes and conditions is also expected in areas where heavy use has compacted soil, trampled vegetation, and altered surface runoff patterns.

Alternative J also provides for higher quality opportunities over current conditions through variation of WRS Class acres and with use limitation in some WRS Classes to lower over-all Wilderness use levels. Alternatives K and A, however, maintain current inventory acres for each WRS Class and provide for the same levels of expected future use. These alternatives would not provide for recovery of Wilderness resource conditions in areas where over-use has affected Wilderness values.

Figure IV-18. Effects on Wilderness Use by Decade



The response of the alternatives to user demand (905 MRVDs) in the fifth decade of the planning horizon varies directly in relation to how WRS acres are distributed within Wilderness in each alternative. The alternatives provide for projected future use of Wilderness as follows: Alternative NC, 41%; K, 48%, A,48%, J,46%; W, 37%; D, 31%; and L, 51%.

No new trail construction is proposed in any of the alternatives. Trail construction activities would alter vegetation along the trail corridor, disturb soil surfaces, and change water runoff patterns along steep slopes, and although localized in effect, would lower the WRS Classification of the area within which it occurs.

Effects on nonwilderness trails have potential consequences for Wilderness. Alternatives that emphasize timber harvest, and propose development of most roadless areas, will affect nonwilderness trail opportunities, displacing current users into substitute areas. Expected consequences to Wilderness include: an increase in demand for trail related use; a need to perform trail maintenance or reconstruction more frequently; and a need to regulate user access to Wilderness to assure maintenance of use and resource conditions consistent with the Wilderness Act and Wilderness management area S & Gs. Alternatives NC, K, A, and J are expected to have the greatest effect on Wilderness as they retain the least amount of roadless land and Alternatives W, D, and L have the least as they maintain more roadless land or expand Wilderness use opportunities.

Other activities, external to Wilderness, that have potential to effect the Wilderness environment, its integrity, and its use, include road construction and timber harvest. Road construction and timber harvest can have a dramatic effect on both the amount and character of Wilderness use. Locating roads and harvest units along or in near proximity to the Wilderness boundary can increase the number of possible entry points, result in user developed trail systems, and increase access to areas of high public interest and use. In addition, harvest areas can alter the wind firmness of adjacent Wilderness timber stands, and may reduce scenic quality experiences of adjacent areas as viewed from within Wilderness. Alternatives that emphasize timber harvest, such as NC, K, A and J are expected to have the greatest incidence of these effects, while W, D and L will have fewer.

Cumulative Effects on Wilderness

There are cumulative effects on Wilderness as a consequence of any of the proposed alternatives. One such effect is the designation or nondesignation of lands as Wilderness by Congress. Approximately 22% of the Forest is currently designated Wilderness. This has the effect of preserving a wide range of natural resources in their natural condition. In Wilderness, water, vegetation, soil and air quality will be maintained in a natural state. The non-designation of suitable lands may result in the development of such land and over time may become unsuitable for future Wilderness consideration. Another effect on Wilderness is the development, such as timber harvest and road construction, that may occur adjacent to Wilderness boundaries. This effect will result in physical changes that over a period of time can influence the type or quality of experience opportunities to be provided in Wilderness and alter the microsite conditions along Wilderness boundaries. Typically, without some form of use limitation, improved access could result in a greater number of visitors entering the Wilderness at more locations, adversely affecting the type of user experience currently being provided or intended. In addition continued Wilderness use at current levels could result in the permanent loss of essential Wilderness character in some locations of individual Wildernesses.

Mitigation Measures for Wilderness

Wilderness settings will be managed in all alternatives except NC through the application of standards and guidelines which apply to all management activities. Management of wilderness in the No Change

Alternative will be accomplished through existing wilderness management plans and current polices. Mitigation measures consist of a broad range of actions that avoid, minimize, rectify, reduce, or compensate for environmental effects.

If recreation use exceeds capacities, or the levels of acceptable environmental change established for any specific WRS class within a Wilderness, specific actions will be taken to reduce unacceptable use levels. These actions may consist of a permit systems, closure of specific areas with in Wilderness, access restrictions, and closures of roads or trails leading to points of entry. In addition, and as a prerequisite to other actions, user education and public contact can would be used to assist in the prevention of misuse and overuse of the Wilderness environment and related resource degradation. The establishment and monitoring of LAC factors for various elements of the Wilderness resource will aid in reducing effects on the environment. The LAC (U.S. Department of Agriculture--Forest Service 1985) process gives primary attention to acceptable existing Wilderness conditions and prescribing actions to protect or achieve those conditions. If the conditions are exceeded, action is taken to bring them into an acceptable range.

In areas that are characterized by concentrated use, mitigation measures will ensure maximum use and enjoyment within wilderness management standards. Typical areas of high use are arterial trail corridors, areas where major trails intersect, converge, or lead to places of high interest or destination, and staging areas or trailheads. Management Area 1a typifies this high use on 14,482 acres in Alternatives K and A. In this WRS class group sizes are larger; more groups will encounter each other; and, where they occur in this class, more campsites would be visible.

To maintain the essential character of Wilderness, group sizes, encounters with other parties, and intervisibility of campsites will be limited, and campfire sites will be designated if resource damage indicates a need. Dispersal of camps from each other and from attractive features within the Wilderness will reduce effects of concentrated use. To manage high intensity use and resource degradation camping may be prohibited in specific areas to facilitate recover of natural conditions (see Mitigation Measures under Vegetation). These and other measures may be found in the S & Gs included in the Forest Plan.

Although all prescribed burning in western Oregon will be scheduled for times when winds are expected to disperse smoke concentrations, smoke and haze may be evident in the airshed over or adjacent to Wilderness. The Clean Air Act and its 1977 Amendments mandate air quality and visibility protection for the Diamond Peak, Three Sisters, Mt. Washington and Mt. Jefferson Wildernesses. New Wildernesses established under the Oregon Wilderness Act of 1984, to date have not been redesignated visibility protected Class I Areas. Additional mitigation measures for reducing the impacts of prescribed burning on Wilderness air quality values include the scheduling of burning to avoid high Wilderness recreation use periods; increasing wood utilization on harvest units; and decreasing suspended particulate emissions production from slash burning (See also the discussion on Air in this Chapter).

During the past 40 to 50 years, fire suppression efforts have generally suppressed fires in the Wilderness at a smaller size than free-burning natural fires. Because of this change in the fire regime there has been some increase in forest residues, although the buildup has not generally reached a critical level in the western Cascades. Over time however, this may develop into a greater problem and larger, more intense wildfires could be expected in the future. The longer fire is kept out of these areas, the more the vegetation develops towards a climax seral stage with higher accumulations of natural dead and down material. Prescribed burning may be considered in Wilderness where necessary to perpetuate natural ecosystem succession without threatening public safety or adjacent nonwilderness lands. For additional information on prescribed burning and fire suppression in the Wilderness see Section 5, Fire.

Relationships with Other Agency Plans or Policies for Wilderness

Coordination with other agencies is an ongoing process to ensure that users and rights afforded them by the Wilderness Act are provided without impairment of Wilderness values. Examples include: the fish stocking program of Oregon Department of Fish and Wildlife (ODFW); taking mineral samples by the U.S. Geological Survey; and collecting water samples by the Environmental Protection Agency.

The Forest and the Confederated Tribes of the Warm Springs Indian Reservation are working together to resolve trespass issues on the Reservation which is bordered by the Mt. Jefferson Wilderness. Forest visitors and commercial users initiating day or overnight use may inadvertently cross the Forest boundary onto the Reservation and risk citation for trespass. Public information about management policy and regulations to Forest users in the Mt. Jefferson Wilderness will be a focus of the cooperative management effort.

Inadequate Information

Information regarding both the physical capacity of Wilderness resources to accommodate specific types of use and the factors relating to the social capacity specific to the Forests 8 Wildernesses, including the amount, duration, type, purpose and point of entry of Wilderness use is inadequate for the purposes of affective wilderness planning and management.

Environmental Consequences Of The Alternatives On Artifacts And Sites

Human use of land and resources now encompassed within the Forest boundary extends over a period estimated to be at least 8,000 years. The physical remains of prehistoric, Euro-American, and early Forest Service administrative use are documented throughout the Forest. Artifacts and sites include rock quarry sites, open lithic sites, rock shelters, religious sites, wagon roads, homesteads, mines, cabins, trails, administrative buildings and structures. These cultural resources are a unique, fragile, and nonrenewable feature of the environment and are recognized by a number of historic preservation laws, regulations, and policies. The probability of exposing or damaging artifacts and sites increases as lands are used in activities that modify the landscape.

Potential impacts to artifacts and sites are relative to the amount and location of ground disturbing activities proposed by the alternatives. All of the alternatives contain activities that reshape landforms or alter the vegetative cover of the landscape. Activities associated with timber harvest generally have the most widespread consequence to artifacts and sites throughout the Forest. Road construction, and building and site development, also have the potential to generate significant impacts, however on a more localized basis.

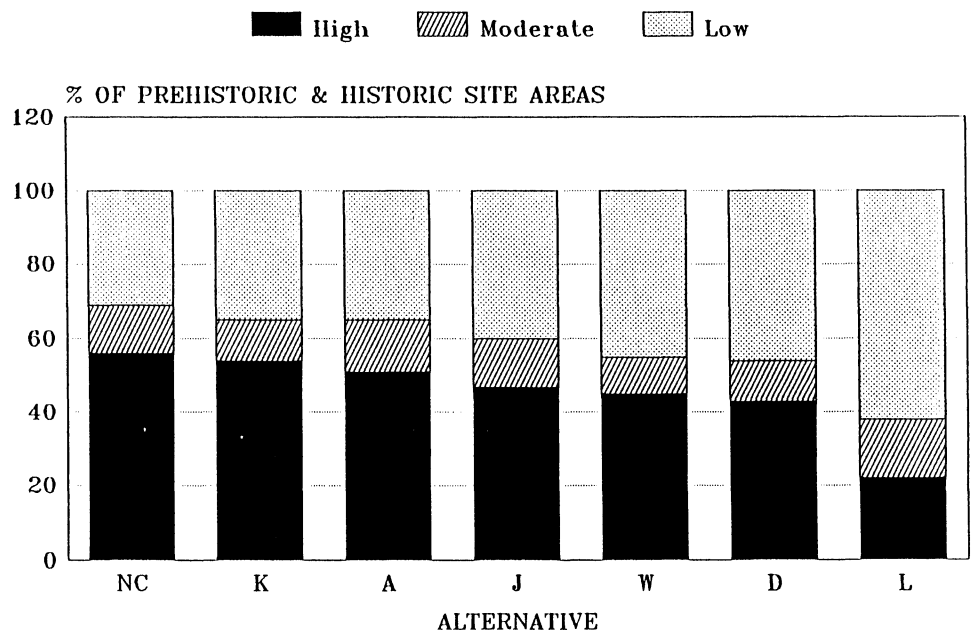
While ground disturbing events can damage artifacts or archeological sites, they also provide opportunities for identification of previously unknown cultural properties. In heavily vegetated environments, the removal of understory and forest duff may provide the only means of locating artifacts. Direct and indirect effects may be natural, project related, or the consequence of public use. Natural processes that affect artifacts and sites include weathering, insect infestation, erosion, moisture, tree fall, trampling by wildlife, and fire. Natural effects may increase in significance when coupled with the effects of human activities but may also generate additional opportunities for discovery and enhancement.

Direct and Indirect Effects of the Alternatives on Artifacts and Sites

The effects of the alternatives on cultural artifacts and sites is assessed for both known sites and for areas where the occurrence of sites is probable. To facilitate analysis of potential impacts, management areas are grouped into three categories of potential effect; high, moderate, and low. (See Figure IV-19 for an explanation of potential effect categories). The greater the number of known or potential sites or areas having frequent and extensive modifications of the environment (moderate to high effect), the greater the risk of adversely affecting artifacts and sites. Activities such as timber harvest and road construction have the most significant effect. Effects on artifacts and sites range from disturbance, destruction, or loss of part or all of the resource, to modification of the surroundings of a site such that its contextual integrity is destroyed.

Timber harvest activities are expected to have the greatest potential to damage artifacts and sites because of the extent of ground disturbance. Timber harvest activities will cause considerable disturbance to surface and subsurface soil profiles in localized areas, such as landings, skid trails, and within harvest units. The repeated use of heavy equipment in these areas to fell trees, and yard and pile logs can result in the disturbance, displacement, or crushing of cultural artifacts and sites.

Figure IV-19. Effects on Known Artifacts and Sites



	Alternatives [1]						
Level of Effects [1]	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
High	56	54	51	47	45	43	22
Moderate	13	11	14	13	10	11	16
Low	31	35	35	40	45	46	62
TOTAL	100	100	100	100	100	100	100

[1]Values are in percent of total prehistoric and historic site areas.
[2]**High** - High potential for major alteration of the environmental setting of significant sites; high potential for disturbance of currently unidentified sites. Opportunities for the identification of new sites, however, is also the greatest at this level.
Moderate - Moderate potential for alteration of the environmental setting of significant sites; motorized recreational use increases threats to unprotected sites; substantial opportunity for interaction of the public with cultural resources.
Low - Low potential for impact from land modifying activities; timber harvesting limited; motorized recreational use constrained; primary effect of wilderness management will be to standing structures, but overall these constitute a small proportion of the cultural resorces in the Wilderness. Less emphasis on identification of new sites; more opportunities for preservation of sites in place.

Road construction activities such as excavation, grading, and filling have the greatest potential to effect sites through ground disturbance. Roads tend to be located in areas where artifacts and sites are most frequently found, such as river valleys and terraces, topographic benches, and ridge systems. Because of the magnitude of disturbance, road construction is expected to have the potential to cause the greatest damage to artifacts and sites. However, cultural resource inventories conducted prior to proposed road construction also provide opportunities to locate previously unknown sites that would otherwise go un-discovered.

The magnitude of effect that each alternative has upon known sites and areas of probable occurrence is determined by the amount of coincidence each potential effect category has with the area of known cultural resource sites, and with each of three cultural resource occurrence frequency classes. Figures IV-19 and Table IV-36 illustrate the effect that each alternative has on artifacts and sites.

As illustrated in Figure IV-19 the potential effect on known prehistoric and historic sites and artifacts is variable among the alternatives. In Alternatives NC, K, A, and J, 60% to 69% of the area occupied by prehistoric and historic sites is within management areas that either have a high or moderate potential to effect cultural artifacts and sites. Alternative L is expected to have the least effect as only 38% of the known site areas is coincident with management areas having high or moderate potential to disturb, displace, or damage artifacts and sites. In Alternatives W (PA), and D 54-55% of the know site areas is coincident with management areas having high to moderate potential effects.

In addition to potential effects to known artifacts and sites, the alternatives have the potential to effect Forest areas where the frequency of sites ranges from high to low. Table IV-36 illustrates the effects of the alternatives on the site occurrence frequency areas of the Forest.

Table IV-36 Effects on Artifacts and Sites by Occurrence Frequency Class

		Alternatives [1]						
Occurrence Frequency Class	**Level of Effect [2]**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
High Frequency (393,254 ac.)	High	47	50	47	45	43	37	18
	Moderate	21	20	21	18	10	18	10
	Low	32	30	32	37	47	45	72
	Total	100	100	100	100	100	100	100
Moderate Frequency (133,675 ac.)	High	74	68	74	67	60	59	29
	Moderate	9	8	9	7	4	9	9
	Low	17	24	17	26	36	32	62
	Total	100	100	100	100	100	100	100
Low Frequency (1,246,590 ac.)	High	53	46	53	52	42	43	18
	Moderate	8	7	8	8	4	8	7
	Low	39	47	39	40	54	49	75
	Total	100	100	100	100	100	100	100

[1]Values are in percent of area.
[2]**High** - High potential for major alteration of the environmental setting of significant sites; high potential for disturbance of currently unidentified sites. Opportunities for the identification of new sites, however, is also the greatest at this level.
Moderate - Moderate potential for alteration of the environmental setting of significant sites; motorized recreational use increases threats to unprotected sites. Future management options are varied; substantial opportunity for interaction of the public with cultural resources.
Low - Low potential for impact from land modifying activities; timber harvesting not permitted; motorized recreational use constrained; primary effect of wilderness management will be to standing structures, but overall these constitute a small proportion of the cultural resorces in the Wilderness. Less emphasis on identification of new sites; more opportunities for preservation of sites in place.

The alternatives are clustered into three groups in respect to their consequences on areas having high and moderate occurrence of cultural sites. Group one, Alternative L allocates the smallest amount of these frequency classes to management areas having high and moderate effects, and thus minimizes potential, yet characteristic, effects from industrial forest operations. Group two, Alternatives NC, K,

A, and J allocate the most area to uses with either high or moderate potential to effect cultural artifacts and sites. Group three, Alternatives D, and W (PA) in respect to area affected, allocates significant areas having high and moderate occurrence of cultural sites to management areas have high to moderate effects although less than Group two.

Assessments to predict accurately the consequences of the alternatives on cultural artifacts and sites is very limited since the actual number, location, and significance of all the cultural resources in the Forest is unknown. It is, however, useful to estimate potential consequences by quantifying the amount of ground disturbing activity generated by the alternatives. Actual impacts to cultural resources within any of the frequency classes will mainly be a result of timber harvest and road construction activity. These activities will occur in management areas having potentially high to moderate effects. Table IV-37 illustrates the predicted amount of ground disturbance due to timber harvest and miles of road construction that will occur in the high and moderate effect categories.

Table IV-37 illustrates the amount of Forest area to be harvested during the next five decades as well as the miles of new road to be constructed. The effect of these activities on known artifacts and sites, as well as areas of high and moderate frequency of site occurrence varies by alternative and by decade. It is evident from this information that effects beyond the second decade will result primarily from timber harvest activities rather than road construction. By the end of the fifth decade effects related to roads will be a consequence of road reconstruction.

Table IV-37. Expected Ground Disturbance on Artifacts and Sites [1]

	Alternatives						
Time Period	**NC [2]**	**K**	**A**	**J**	**W**	**D**	**L**
1st Decade							
M Acres	NA	125.7	120.6	101.8	91.0	98.9	33.1
Miles	NA	550	500	450	400	300	120
2nd Decade							
M Acres	NA	126.4	121.2	100.0	93.6	99.5	27.6
Miles	NA	90	130	70	70	50	40
3rd Decade							
M Acres	NA	116.7	112.5	83.1	80.5	83.0	21.9
Miles	NA	90	70	60	60	30	20
4th Decade							
M Acres	NA	105.3	99.7	87.1	80.7	83.4	28.9
Miles	NA	80	50	40	50	10	10
5th Decade							
M Acres	NA	118.1	115.7	82.0	81.3	85.1	23.2
Miles	NA	40	50	40	20	10	10

[1]Ground disturbance is from acres of timber harvest and miles of road construction.
[2]Data for the No Change Alternative is not available. However, acres harvested and miles of road to be constructed and related effects for this alternative are expected to be similar to Alternative K.

Cumulative Effects of the Alternatives on Artifacts and Sites

The artifacts and sites on the Forest are part of a rapidly diminishing, nonrenewable resource base. The combination of impacts from past landscape modifications, private development, vandalism, and natural deterioration have destroyed much of this record. The exact extent of the loss and the range of site types affected cannot be determined since there were no cultural resource inventories or records preceding most of these activities prior to about 1975. Thus there are few opportunities today to mitigate the cumulative effects of the past. Once destroyed, a cultural resource cannot be replaced. This points to the need for even more careful consideration of cultural resources in the future.

The existing cultural resource compliance process requires that the cumulative effects to cultural resources of any proposed action taking place on National Forest land be considered during project planning. Potential adverse effects can be avoided or mitigated through a variety of measures. Some impacts can be mitigated through scientific data recovery. However, data recovery (excavation) is inherently a destructive process, especially if it is spurred by the need to essentially "salvage" sites in advance of ground disturbing projects such as timber harvest. Data recovery plans address current research questions by using current theories and techniques. But such projects may also destroy data that would be needed in the future when new theories and techniques are developed, thus enhancing the value of remaining sites.

In addition, there is no adequate compensation for the physical loss of some sites. These are resources which, in part, are aesthetically significant and convey, by their existence in place, a special human link with the historic past. For example, the images evoked by the prehistoric carving on a rock outcrop or a rustic cabin are just as strong, and possibly stronger, in a young child as in a trained scholar. The cumulative effects of the various alternatives on these types of resources cannot be mitigated.

Mitigation Measures for Artifacts and Sites

Mitigation measures are specified in the S & Gs included in the Forest Plan and implemented through the Forest-wide cultural resource program. This program integrates inventory, evaluation, protection, and enhancement of cultural resource values into all Forest management activities of a ground disturbing nature.

An important step in the preservation and protection of artifacts and sites is a systematic inventory well in advance of Forest management activities. Prior to any ground disturbing activities the Forest will identify, evaluate, and mitigate impacts to all National Register eligible sites and artifacts that may be affected by a project. On a site specific basis, the ultimate decision whether to practice avoidance of a site or to carry out mitigation measures in lieu of avoidance will be based on both the nature and uniqueness of the cultural values at the site, and the costs of the desired mitigation measure. If excavation is determined to be the appropriate response, a Data Recovery Plan is prepared and implemented by professional archeologists in consultation with the State Historic Preservation Office and reviewed by the Advisory Council on Historic Preservation.

Proposed roads, trails, timber sale units, and other project boundaries can generally be adjusted without additional cost or inconvenience, if the need is determined during the early planning stages of the project. This eliminates effects or threats to cultural sites while encouraging "business as usual" with respect to other management activities. Frequently, activities may be carried out around a cultural site with minimal disturbance through creation of protective buffer zones, use of special technologies, or reduction of the actual area of ground disturbance.

Mitigation measures for cultural resources often include a combination of practices, particularly as they are applied to timber harvest operations. For example, when logs are yarded to a landing area the full suspension of logs substantially reduces or avoids disturbance to the ground surface. Full suspension, in combination with directional felling of trees away from the cultural site, and monitoring of the harvest activities by trained cultural resource technicians, can provide nearly full protection to the cultural resource site.

Where tractor logging is planned, the restriction of the overall number of skid trails and a designated system of trails are utilized to reduce effects. In previously harvested areas, existing skid trails are used wherever possible. The concept of designated skid trails has been successfully tested in soil compaction studies but the concept is likewise applicable to cultural resources (Froelich et al. 1981).

The use of a buffer between equipment and the ground surface may be suitable where there are no above ground structural remains. Recent studies on the Winema National Forest have tested the concept of logging over snow as an effective method of protecting cultural resources (Frances Philipek, personal communication). The results indicate some success as long as the soil characteristics, snow depth and moisture content, slope, and air temperature meet certain criteria. The location of the landings, the method of subsequent slash piling, and careful administration of the timber sale contract to see that specialized criteria are met, are crucial to the success of this technique.

On occasion it is impossible or economically unrealistic to avoid completely, a cultural site, particularly during road construction or reconstruction operations. Where there are no above ground structural features or remnants, crushed aggregate or other materials may be applied to protect the cultural site. The unavoidable loss of an historic cultural resource site can be mitigated by mapping, photo documentation or scaled drawing prior to project implementation. Normally, this documentation is done to the standards of the Historic American Building Survey (HABS) or the Historic American Engineering Record (HAER), whichever is applicable. This process is one of the more common measures preceding the removal of historic properties. In the case of linear features, such as historic ditches, wagon roads, highways, railroad grades, and so forth, a combination of thorough documentation of the feature with preservation of a designated segment may be acceptable.

In some cases, it may be appropriate to excavate archaeological resources. Specific criteria are considered including the significance of the property, the cost of data recovery and the scope of the project. Guidelines specified in the Forest Service Manual are followed and the excavation may be contracted out to a consulting archaeologist. Enhancement and interpretation of cultural sites present an opportunity for increased public education and awareness, although occasionally public use may result in the destruction of cultural properties because of vandalism, relic collecting, theft, and carelessness. Protective measures include directing public use away from sites, maintaining the confidentiality of specific prehistoric site locations, and periodic monitoring of sensitive areas.

Relationships With Other Agency Plans and Policies for Artifacts and Sites

Whenever a significant/eligible cultural resource site is located within the area of a projects potential environmental effect, the Forest Service must consult with the State Historic Preservation Office (SHPO) to determine whether the project will have an effect on the values of the site that qualify it for the National Register of Historic Places. If the project will affect the site, then the Advisory Council on Historic Preservation must be given the opportunity to comment on the project prior to its approval. This consultation process is defined in 36 CFR 800, and fulfills the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended.

Consultation has and will continue to occur with the Confederated Tribes of the Warm Springs, Grand Ronde and Siletz, and the Cow Creek Band of the Umpqua. Consultation and coordination with Native American Tribes regarding the affected environment of the Willamette National Forest has resulted in a greater awareness of a American Indian cultural heritage, values, and issues. Consultation has focused on the site testing program with requests for information about areas of historical, traditional, and cultural use on the Forest. When a site of significance is discovered, Native American Tribes will be consulted and involved immediately. No burial sites have been located on the Forest to date.

Inadequate Information

Current inventories of cultural resources are incomplete regarding the number, location and significance of artifacts and sites in the Forest, thus, limiting through evaluation of potential effects of alternative Forest management proposals on cultural resources.

Environmental Consequences Of The Alternatives On Special Interest Areas, Old Growth Groves And National Natural Landmarks

There is currently one established Special Interest Area (SIA), Lamb Butte Scenic Area, 28 designated Old Growth Groves (OGGs), and no National Natural Landmarks (NNLs) in the Forest. The Forest inventory of potential Special Interest Areas shows 49 areas, totaling 36,960 acres that could be classified as cultural, zoological, geological, botanical, scenic, or recreation areas. A current inventory of OGGs includes 38 areas totaling 7,496 acres. The inventory of potential National Natural Landmarks includes 21 areas, totaling 39,652 acres, nearly half of which are preserved within Congressionally designated Wilderness.
Because these types of areas also provide recreation opportunities, they affect the capability of the Forest to meet present and projected demand for various types of dispersed or developed recreation settings. The designation of special, restricted use areas also affect the capability of the Forest to provide other recreational opportunities and services.

Areas that are designated under these three categories as a result of implementing one of the proposed alternatives will be managed either in a natural or developed condition where appropriate to accommodate access for use and enjoyment of individual areas. Generally, development areas will receive improvements for viewing and interpreting special features and resources.

Certain types of activities or developments adjacent to existing or within potential SIAs, OGGs, or NNLs sites could result in disturbance to the specific values to be protected, studied or enjoyed. In the remaining nonestablished areas, future designation may be precluded by resource development activities such as timber harvest or road construction, or natural events such as fire, flood, or overuse by wildlife.

Direct and Indirect Effects of the Alternatives on Special Interest Areas, Old Growth Groves and National Natural Landmarks

The most significant effect upon the potential SIAs, OGGs and NNLs is whether areas are preserved or not. For areas that are preserved only the incidental effects associated with recreation development, use, or natural processes are anticipated.

For areas allocated to uses that alter the conditions of individual areas or their surroundings, the values or features of interest would be potentially lost or impaired. The degree of loss or impairment is relative to the extent of development associated with each management area to which potential SIAs, OGGs or NNLs are allocated.

The disposition of potential SIAs, OGGs and NNLs in the alternatives is summarized in Tables IV-38, IV-39 and IV-40. As indicated by the figures below, Alternatives W (PA), D, and L would preserve the characteristics and values associated with 84% to 100% of the potential SIA acreage. In Alternatives NC, K, A, and J between 12% and 68% of the potential acres would be allocated to uses that preserve their special features or natural qualities. In Alternatives NC, K, and A, the characteristics and values of potential Special Interest Areas would be either impaired or lost on 32% to 88% of the inventoried acreage.

Lamb Butte, the only established Special Interest Area in the Forest, is subject to the influences of adjacent timber harvest and road construction along it's western boundary in Alternatives NC, K, A and J. However, adjacent activities would primarily affect scenic quality of the surrounding area rather than the physical resources of Lamb Butte. All other alternatives propose complementary forms of management in the area surrounding Lamb Butte Special Interest Area.

Table IV-38. Effects on Potential Special Interest Areas

	Alternatives						
Development Category [1]	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Low	12	24	27	68	93	84	100
Moderate	50	18	43	14	5	5	0
High	38	58	30	18	2	11	0
TOTAL	100	100	100	100	100	100	100

[1] Degree of effect associated with development category in percent of inventory acres:

Low = Preserves conditions and values.
Moderate = Activities may impair conditions or values.
High = Activities may result in the loss of conditions or values.

As indicated in Table IV-39, Alternatives J, W (PA), and L would preserve the characteristics and values associated with 70% to 95% of the potential OGG acreage. In Alternatives NC, K, A, and D between 30% and 66% of the potential acres would be allocated to uses that retain the special qualities and outstanding features of Old Growth Groves. In Alternatives NC, K, and A, the characteristics and values of potential Old Growth Groves would be either impaired or lost on 61% to 70% of the inventoried acreage.

Table IV-39. Effects on Potential Old Growth Groves

	Alternatives						
Development Category [1]	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Low	30	31	39	70	95	66	73
Moderate	17	11	17	7	0	4	19
High	53	58	44	23	5	30	8
TOTAL	100	100	100	100	100	100	100

[1] Degree of effect associated with development category in percent of inventory acres:

Low = Preserves conditions and values.
Moderate = Activities may impair conditions and values.
High = Activities may result in the loss of conditions and values.

The effects of the alternatives on potential NNLs as indicated in Table IV-40 include: preservation of between 91% and 100% of the inventoried area in Alternatives W (PA), D, and L, and the impairment or loss of NNL features and natural qualities in 27% to 34% of the inventoried areas in Alternatives NC, K, A, and J. There are no areas proposed by the alternatives for inclusion into the National Park Service National Natural Landmarks System. In Alternatives W, D, and L most all of the potential NNLs would be coincident with formally established research areas, Wilderness, Wild and Scenic Rivers, and areas proposed for designation as Special Interest Areas, Old Growth Groves, and semiprimitive recreation areas.

Table IV-40. Effects on Potential National Natural Landmarks

	Alternatives						
Development Category [1]	NC	K	A	J	W	D	L
Low	70	66	71	73	91	95	100
Moderate	22	25	22	24	4	3	0
High	8	9	7	3	5	2	0
TOTAL	100	100	100	100	100	100	100

[1] Degree of effect associated with development category in percent of inventory acres:

Low = Preserves conditions and values.
Moderate = Activities may impair conditions and values.
High = Activities may result in the loss of conditions and values.

Cumulative Effects on Special Interest Areas, Old Growth Groves and National Natural Landmarks

As natural settings are altered through timber harvest and road construction, the capacity of the Forest to provide some types of Special Interest Areas, Old Growth Groves and National Natural Landmark settings is diminished. This is particularly true of potential areas not designated as SIAs, OGGs or NNLs in any of the alternatives and whose attributes are not preserved by similarly protective management area allocations. The special features and attributes of these areas will likely be altered during the planning horizon through intensive Forest management activities. In addition, changes to vegetation patterns, surface drainage, and soil horizons on land adjacent to established SIAs, OGGs or NNLs, may over a period of time affect the natural processes of individual areas. Catastrophic events such as fire and flooding could destroy the values within both potential and designated Special Interest Areas, Old Growth Groves and National Natural Landmarks.

Mitigation Measures for Special Interest Areas, Old Growth Groves and National Natural Landmarks

Special Interest Areas, Old Growth Groves and National Natural Landmarks will be managed principally for public recreation use, study, and enjoyment. Recreational use is permitted when there is no conflict with protection of distinctive characteristics; use will be restricted only to the extent necessary to protect unusual features. Mitigation measures to reduce impacts from vandalism or overuse include public education, rehabilitation, displacing users into less utilized sites, and closing areas. Diseased or hazardous trees located in high use areas or along trails will be removed for the safety of Forest users.

Relationships with Other Agency Plans or Policies for Special Interest Areas, Old Growth Groves and National Natural Landmarks

The effects of implementing any of the alternatives are not expected to conflict with current objectives of State and local planners. Agencies such as the State Oregon Division of Parks and Recreation and the State Historic Preservation Office are consulted regarding the management of areas such as SIAs, OGGs and NNLs. The State Tourism Council is pursuing destination point features in Oregon. As interest among public agencies and private entrepreneurs in developing the State's tourist industry increases, there may be a consequent increase in interest in establishing SIAs, OGGs and NNLs as visitor destination points.

Incomplete or Unavailable Information

Assessments of resource capacity of individual areas to accommodate recreation use and related activites without impairment of special values or features.

Environmental Consequences Of The Alternatives On Research Natural Areas And The H.J. Andrews Experimental Forest

As land use and resource utilization intensify, the need for research involving the climatic, geologic, and biologic systems of the forest environment is expected to become greater. With the ever greater demand for the various uses of land, both public and private, more knowledge is necessary to protect and keep these lands productive. On the Forest, areas have been selected and/or proposed as Research Natural Areas which are representative of cells (habitats, communities, organisms, etc.) deemed important elements in the Pacific Northwest coniferous biome.

Research Natural Areas supply ecological reference points and provide experimental controls for assessing the results of activities in managed areas of the Forest. The four Research Natural Areas are currently used to preserve a representative natural situations including the subalpine mountain meadows, subalpine bogs, noble fir stands on mountain ridges, and old-growth Douglas-fir/western hemlock forests of the Western Cascades. These areas are also used by amateur botanists and biologists, and academic institutions.

Popular Research Natural Areas are vulnerable to disturbance as a result of vegetative trampling or removal of specimens. In addition to the four existing Research Natural Areas, five additional areas have been identified as potential RNAs. If these areas are allocated to other uses, future opportunities to establish these areas as RNAs may be limited or forgone. (See Chapter III, Research Natural Areas and H.J. Andrews Experimental Forest for detailed descriptions of these areas.)

While there are no additional Experimental Forests proposed for the Forest, the management of the H.J. Andrews Experimental Forest (HJA) will continue to meet specific research needs through a joint effort of the Pacific Northwest Forest and Range Experiment Station and the Forest. Research in the HJA focuses on the ecology and management of coniferous forests and watersheds in the Douglas-fir region. Projects have studied the effects of timber harvest and roads upon land stability, site productivity, sediment yields, and water quantity and quality within the old-growth Douglas-fir forest environment, old-growth, and eco-system functioning.

Direct and Indirect Effects of the Alternatives on Research Natural Areas and H.J. Andrews Experimental Forest

The research activities in the H.J. Andrews Experimental Forest (HJA) are often designed specifically to alter vegetation, landform, wildlife habitat, soil or water. In this respect, timber harvest and road building activities are induced for the purpose of study and research. These induced effects may be viewed as adverse in an environmental sense although they are desired and essential in a research context.

In addition to changes that may result from research purposes, minor changes in conditions are expected a consequence of natural events such as wind, fire, insect, and disease within the HJA and RNAs. Extensive timber harvest on the perimeter of these areas could reduce the effective size of some of the included habitats.

The Spotted Owl Habitat Areas located in the HJA could restrict some of the activities necessary for conducting research in all alternatives, except the NC Alternative.

As a consequence of implementing any of the proposed alternatives there would be impacts to potential RNAs. The location and magnitude of these effects are relative to the number of areas allocated as RNAs in each alternative and the disposition of the remaining areas not allocated as RNAs.

Table IV-41 illustrates the acreages of individual RNAs provided in each alternative.

Table IV-41. Research Natural Area Acreage

	Alternatives						
Area Name	NC	K	A	J	W	D	L
Middle Santiam 1	1,152	1,152	1,152	1,152	1,152	1,152	1,152
Three Creeks	--	--	--	512	725	--	--
Wildcat Mountain	1,003	1,003	1,003	1,003	1,387	1,003	1,003
McKenzie Pass 1	--	--	--	1,088	1,130	1,088	--
Hagan Block	853	--	853	1,280	1,280	1,280	--
Olallie Ridge	725	725	725	725	725	725	725
Torrey-Charlton 1	2,048	2,133	2,048	2,112	2,133	2,133	--
Gold Lake Bog	469	469	469	469	469	469	469
Rigdon Point	--	--	--	427	469	427	--
TOTALS	6,250	5,482	6,250	8,768	9,470	8,277	3,349

[1] RNAs that are wholly or partially within established Wilderness.

Table IV-42 displays the distribution of acreages of established and potential RNAs by development categories for each alternative.

The effects on potential RNAs allocated to other than RNA uses is based upon whether the allocated uses would result in no development, limited development, or full development of inventoried areas. Allocation of areas to full or limited development would preclude their use for baseline studies of undisturbed environments.

Table IV-42. Effects on Research Natural Areas

	Alternatives						
Development Categories	NC [2]	K	A	J	W	D	L
No Development	79	69	79	94	100	96	94
Limited Development	7	1	7	2	0	0	1
Full Development	14	30	14	4	0	4	5
TOTAL	100	100	100	100	100	100	100

[1]Includes Middle Santiam RNA within the Middle Santiam Wilderness, the western portion of the Torrey-Charlton RNA within Waldo Lake Wilderness, and a portion of the McKenzie Pass RNA within the Three Sisters Wilderness.

[2]Values are in percent of total acres of potential and established RNAs.

Many of the RNAs provided by the alternatives are surrounded by proposed uses that buffer or otherwise limit effects from the use or management of adjacent lands. All but two RNAs in Alternatives NC, A, and J; four in Alternatives K and W (PA); three in Alternative D; and one in Alternative L are surrounded by uses that buffer or otherwise limit effects from adjacent management activities. Several un-buffered RNAs would be subject to the potential effects of adjacent management such as timber harvest and road construction on adjacent lands.

In some of the alternatives, research potential woull be lost due to development of some areas for resource utilization activities, such as road construction and timber harvest. In Alternatives NC, K, and A, between 21% and 31% of the potential RNA acreage is proposed for resource development. Alternatives J, W (PA), D and L would retain between 94% and 100% of the Forest's inventoried RNA potential in an undisturbed condition.

Cumulative Effects of the Alternative on Research Natural Areas and H.J. Andrews Experimental Forest

The nondesignation of areas as RNAs and subsequent alteration of their conditions over a period of time would result in an eventual loss of research potential. Losses, over time, because of nondesignation would be relative to each areas research potential as described in Chapter III.

Mitigation Measures for Research Natural Areas and H.J. Andrews Experimental Forest

The primary form of mitigation of undesirable effects is boundary identification of individual areas. Areas are generally defined as "closed systems" such as a complete subdrainage or ridge top to avoid contributions of effects such as displaced soil or water runoff from adjacent areas.

In some instances, the intensity of activities on adjacent land is expected to be modified to protect values within the research areas. In the case of RNAs, the establishment report, prepared for each area, sets forth an area objective of maintaining the ecosystems within the boundaries in a natural state of succession.

Other measures include the prohibition of timber harvest, transportation, and utility corridors; withdrawal from mining and mineral leasing; the discouragement of recreation use; and erecting barriers such as fences to exclude domestic stock if necessary. Trails necessary for research projects will be constructed, reconstructed, and/or maintained to the minimum standard required for projects and to provide basic resource protection.

Relationships With Other Agency Plans or Policies for Research Natural Areas and H.J. Andrews Experimental Forest

The HJA is managed according to an Intra-Agency Agreement with the PNW F&RES. Periodic local site committee meetings are held with the PNW, the Forest, and OSU and other interested scientists to plan and discuss on-going research and administrative activities

There are no conflicts between the effects of the alternatives on the Experimental Forest and established Research Natural Areas and the plans of others agencies. There are no conflicts with management of lands of other ownerships and the H.J. Andrews Experimental Forest or established and proposed

Research Natural Areas. A conflict could arise with the Research Natural Area committee if a potential RNA in the Forest is the only area that could fill a research cell need, and is not proposed for establishment.

Incomplete or Unavailable Information

An inventory of existing conditions of proposed RNAs as affected by historic use and natural events.

Environmental Consequences Of The Alternatives On Transportation Systems

The Forest has a developed road transportation system that allows the flow of timber and minerals to local communities. The transportation system also allows access to major portions of the Forest for timber harvest, hunting, fishing, sight seeing, and numerous other activities. Management of resources and programs effects the existing transportation system and determines the need for further development, maintenance, reconstruction and use of roads.

Direct and Indirect Effects of the Alternatives on the Transportation System

Soil and Geology - Soil properties, rock properties, and topography have direct effects on transportation (road) facilities. Availability, location, design, construction, maintenance, reconstruction, and cost of roads are effected by the geological characteristics of the Forest.

The existing Forest development road system is effected similarly in allalternatives. A portion of the road system is on stable soil and rock subgrades. The affect of the stable soil and rock subgrade on the road system is a generally stable road with few, if any, mass movement failures. Other portions of the road system are on moderately stable, unstable, or very unstable soil and/or rock subgrades. The natural effects on roads of the less stable soils/rocks is an increased incidence of road failure and an increased need for road maintenance. Mass soil movements could result in loss of roadbeds. The frequency of roadbed failure would be higher on less stable soils, especially where sideslopes exceed 50%. Loss of roadbed restricts or prohibits the availability of access, either through restriction of road width, or complete loss of the road in the area of mass soil movement. Road reconstruction is required more frequently, and it is more costly on unstable soils. Road maintenance is also more costly on less stable soils.

Road surfaces are typically constructed and surfaced with local rock materials. The quality of rock on the Forest varies widely by locality and geology. Roads surfaces in areas of volcanic breccias and tuffs, generally, are easily degraded by traffic and weather. In order to provide a serviceable road for timber harvest, road surfaces constructed of volcanic breccias and tuffs usually require a greater depth than those made from andesites and basalt materials. The additional depth of surfacing increases the cost over the average cost of constructing new roads. The rapid degradation of breccias and tuffs also requires frequent addition of rock to maintain adequate surface standards. The structural strength of breccias and tuffs is less than that of the andesites and basalts, and could result in a road surface that is driveable during only summer months. All alternatives propose roads in areas of andesite and basalt as well as breccias and tuffs. The alternatives proposing the most road miles, Alternatives NC, K, and A will have the highest proportion of new roads of the adesite and basalt materials. Alternatives J, W, and D will have an approximately like proportion of new road in breccias/tuffs and andesite and basalts. Alternative L will have the largest proportion of new road surfaces of the breccias and tuffs.

New roads would be effected by the soil, rock, and topography that the roads are located on. The significance of the effects are proportional to the number of miles constructed in each alternative. Alternatives with the highest number of new road miles will have the highest number and highest percent of new road miles on unstable and very unstable soils. The natural occurance of mass movements impacting roads will be highest for Alternatives K, A, and NC. Mass soil movements effecting new roads will occur at moderate intervals for Alternatives J, W, and D. In Alternative L the occurance of mass soil movements effecting new roads will be lowest in total numbers, but not necessarily in number of occurances per mile of road. A moderate number of occurances is expected in Alternative L.

Timber - Timber management would have direct and indirect effects on the existing road system and on new roads in all alternatives.

Timber harvest creates a demand for low standard roads to gain access to timber harvest sites and to haul timber from the harvest sites off the Forest. Most road construction on the Forest is in response to timber access needs. The alternatives with the highest allowable sale quantities, require the greatest number of miles of new low standard road construction.

Timber haul has physical direct effects on roads. Repeated truck trips create wear on road surfaces, and can lead to the eventual failure or a need to reconstruct road surfaces. Alternatives NC, K, and A result in the highest rate of wear on the highest number of miles of road. Alternatives J, W, and D create an amount of haul volume that is less than has been produced during the last few years. The haul volumes in Alternatives J, W, and D will produce a moderate rate of wear on a majority of the road system. Alternative L will create a lower amount of timber haul volume than the other alternatives. The rate of wear on road surfaces due to timber haul under Alternative L will be low to moderate and will occur on fewer miles of road than for the other alternatives.

Timber haul also has indirect effects on roads in the Forest. Alternatives that produce the greatest quantities of timber haul, also create the largest amounts of cooperative road maintenance funds which are collected from timber purchasers to be used on Forest roads. Therefore, under alternatives with high haul volumes (NC, K, and A) more funds are available for road maintenance. This results in a higher percentage of road miles being adequately maintained to the required standards. Alternatives J, W, and D produce less cooperative road maintenance funds than have been historically collected. This would result in increased need for congressional budget funds for maintaining roads at historic levles. Reduced haul over roads could reduce the need for maintenance or result in reduced road maintenance or limited access in some areas if no replacement funds are provided. Alternative L would result in a greater proportion of the road system being closed to travel, and reduced maintenance on the remaining road mileage.

Recreation - Recreation use on the Forest creates demand for roads to accomodate public travel. The type of recreation use creates different kinds of affects on the road system. Higher recreation volumes create a demand, generally, for higher standard roads(two lane or wide single lane, higher travel speeds, open to public travel, smoother roadway surfaces, greater visibility, etc.)

Driving for pleasure creates the highest demand of any recreation use for roads open to public travel. Alternatives NC, K, A, J, and W create the highest amounts of dispersed recreation, a portion of which, is associated with driving for pleasure. Demand for roads open for public use creates safety concerns and results in a need for higher standard roads that are well maintained. Alternatives D and L will produce the lowest demands for driving for pleasure experiences, and therefore, create fewer needs for safety, roads open to the public, or higher constructed and maintained standards.

Developed recreation creates demands for higher standard roads to and in develped recreation sites. Alternatives J, W, and D create new developed recreation sites and will require a small number of new miles of high standard road construction associated with these sites. Traffic generated by these new sites would add to the traffic volume on roads leading to developed sites from major highways. Safety concerns would increase on these roads and could increase the need for reconstruction on some roads.

Hunting use has a varying effects on roads. Hunting increases the amount of travel on the road system during a portion of the year. However, public demand for a quality hunting experience, especially elk hunters, requires that some roads be closed to motor vehicle travel during the hunting season.

Wildlife - Management requirements for management indicator species including bald eagles, peregrine falcon, northern spotted owl, pileated woodpecker, Roosevelt elk, and marten could have direct affects on the road system. Protection of these species often requires that roads be closed during certain seasons of the year, may prohibit new road construction, or limit the season of other types of road activity. Alternatives D and L protects the most acres of bald eagle, spotted owl, marten, Rooosevelt elk and pileated woodpecker habitat. These Alternatives would have the potential to prohibit or restrict the most road activities. Alternative W protects somewhat less acres of habitat, therefore would prohibit somewhat fewer road activities. Alternatives NC, K, A, and J have the least potential of effecting use or construction of roads.

Cumulative Effects of the Alternatives on the Transportation System

Soils and Geology - Over time the cumulative affects of soils and geology on roads are similar to their direct and indirect affects. Mass movements will continue to occur on road locations as a result of natural instability of the landscape. Sometimes these mass movements will cumulatively neccessitate reconstruction or relocation of a road facility. Often, though, maintenance will continue to be adequate in providing the needed road facility over time. Road surfacing continues to break down over time, and is lost through erosion processes. Cumulatively road surfacing composed of breccias and tuffs will need frequent replacement, and may neccessitate other types of road surfacing when these are cost effective.

Timber - Timber harvest and haul cumulatively affect the road system. Alternatives producing the highest timber harvests will have the greatest need during the planning horizon for an extensive and well maintained road system. Alternative L producing the least timber harvest and haul volume will have the least need during the planning horizon for an extensive and well maintained road system. over time, Alternative L, will have the affect of lowering the maintenance requirements, closing more roads, keeping more roads in a minimum level maintenance category, and may result more miles being removed from the transportation system than other alternatives.

Recreation - Recreation is projected to increase over time on the Forest. Cumulatively, recreation needs, especially driving for pleasure, and developed recreation, will require a certain number of roads constructed and maintained to a high standard over time.

Wildlife - Cumulative affects of wildlife over time on roads are that certain areas of the Forest will continue to prohibit roads, thus restricting access. Hunting pressures will continue to increase, and may have the result of more roads being closed to motor vehicle travel in future decades than is planned in the first decade. This affect, however, is not known with any certainty.

Mitigation Measures for the Transportation System

Standards and Guidelines represent mitigating measures for the transportation system. Design and construction methods incorporating sound geotechnical practice partially mitigate that affects of soil and geology on roads. Slope stabilization, retaining walls, locations avoiding known areas of instability, geotechnical investigation, and surface stabalization measures are all examples of mitigating measures currently being used on the Forest, and that will continue to be used for any of the alternatives.

Relationships with Other Agency Plans or Policies for Transportation Systems

Cooperative agreements and Memorandums of Understanding with Bureau of Land Management, State of Oregon, counties, and private concerning roads will need to be considered in the implementation

of the Forest Plan. State agency direction concerning elk management will affect road closures. The Forest borders other National Forests; cross haul occurs from timber harvest on these forests and shall be considered in the location, design, construction, maintenance, and management of roads. Any potential reconstruction of the Waldo Lake Road will entail cooperation with the Deshutes National Forest.

Incomplete or Unavailable Information

Traffic data on the Forest is incomplete. Selected roads have had traffic surveilance data generated. Most data is at least three to four years old.

Effects of elk management on roads is insufficient at this time. Long-term research is currently being conducted in Eastern Oregon that may provide sufficient bases for road management.

Environmental Consequences Of The Alternatives On Minerals and Energy

Regulation of mineral and energy activities on the Forest is shared with the Bureau of Land Management (BLM). The demand for access to Forest lands for the purpose of mineral and energy exploration and development is expected to increase over the long term. Requests for access will be processed in a timely manner as prescribed by applicable laws, regulations, and policies.

Implementation of management activities requires the expenditure of energy. The amount of energy used varies by alternative although it is not possible at this time to quantify the energy requirements.

Direct and Indirect Effects of the Alternatives on Minerals and Energy

Land allocations and access development vary by alternative. Alternatives with more restrictive land allocations would place higher emphasis on the protection of scenic values, dispersed recreation values, water quality, special and unique habitats, wildlife habitat. Access would be less developed in alternatives emphasizing these values because lands available for timber harvest would be reduced.

Opportunities for exploration and development of minerals and energy would be greatest in Alternatives NC, A, K, and J, respectively. Alternatives W, D, and L, respectively would place increasing emphasis on scenic values, wildlife habitat protection, recreation, water quality, and other nonconsumptive resource values and would result in decreasing opportunity for mineral and energy development.

Direct and indirect energy requirements would be affected by all alternatives.
Direct energy requirements would include those required for timber harvest, road construction and maintenance, and administrative travel. Alternatives would require energy expenditure in proportion to the timber harvest levels and intensity of timber management. Indirect energy requirements include processing wood products and transport of products to mills and consumers. The energy requirements for the alternatives, ranked in order of increasing requirements would be NC, K, A, J, W, D, and L.

Cumulative Effects on Minerals and Energy

As mineral and energy development occurs, there would be a decrease in the availability of area open for exploration. The removal of minerals from the Forest depends on demand. Alternative L would have the highest potential to restrict mineral and energy development over the long term followed by Alternatives D, W, J, A, K, and NC, respectively. These effects would be caused by management areas prohibiting or highly restricting development and access.

The use of energy to implement the alternatives increases over time all Alternatives except L. The increased energy requirements result from the need to access steep, rough terrain, use increasingly complex timber harvest systems, and intensive timber management practices such as pre-commercial and commercial thinning, control and management of competing vegetation, application of fertilizers, and increased mitigation or enhancement activities needed to maintain water quality, fish habitat, wildlife habitat, and recreation facilities.

Mitigation Measures for Minerals and Energy

Forest-wide standards and guidelines (S&Gs) and management area S&Gs have been developed to provide direction for mineral and energy exploration, development, extraction, and rehabilitation.

Relationships With Other Agency Plans or Policies for Minerals and Energy

U.S. Department of Agriculture, Forest Service recommendations to the BLM regarding the availability of lands for mineral leasing are based on whether development activities could be implemented on Forest lands and meet the management requirements of the Forest Plan. Every application for leasable minerals requires site specific review of environmental effects. Standards and special permit stipulations are used to direct project activities.

Regulation of mining and drilling administered by the Department of Geology and Mineral Industries (ORS Chapters 516,517, and 520). Activities permitted on the Forest will be conducted in compliance with established rules.

Fill and removal operations conducted by the Forest will meet permit requirements of the Division of State Lands (ORS Chapters 274, 517, and 541).

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

This Section addresses the effects of the Preferred Alternative (W) on long-term productivity. Forest resource management is a long-term venture and maintaining or maintaining the capacity of the land to provide resource outputs is a primary long-term objective. Short-term uses affect quality of life for the public. Primary examples on this Forest are timber harvest and recreation. The relationship between the short-term uses in the Preferred Alternative (W) and the long-term productivity of the Forest are discussed below.

Long-term productivity changes as a result of various management practices on the Forest. Forest management practices will have direct, indirect, and cumulative effects on the economic, social, and biological environment.

Soil and water are two key factors in ecosystem productivity, and these resources will be protected to avoid damage which could take many decades to rectify.

Wood fiber production will be increased as some of the older stands are harvested and converted to faster growing second growth stands. Timber rotations are normally over 80 years and are managed for long term sustained yield capacity. Silvicultural practices such as the use of commercial tree thinning will also generate measurable long-term gains in wood fiber production.

Opportunities for dispersed recreation use, including hiking, camping, fishing, hunting, snowmobiling, sightseeing and cross-country skiing will be maintained and increased for future generations. Activities planned on the Forest change the setting these activities occur in, but will not reduce the long term potential of the Forest to provide recreation opportunities.

The management of fish and wildlife habitat is designed to maintain viable, well distributed populations of existing native and desired non-native vertebrate species throughout the Forest planning area. The abundance and diversity wildlife species depends on the quality, quantity, and distribution of habitat, whether used for breeding, feeding, or resting. Seven individual species of birds and mammals, one group of birds, and two groups of fish have been selected as management indicator species (MIS). MIS are used to represent the habitat requirements of all fish and wildlife species found on the Forest. By managing habitats and populations of indicator species, the other species associated with the same habitat will also benefit. The Preferred Alternative (W) provides additional emphasis on maintaining long term habitat diversity by protecting special and unique habitats associated with riparian areas, marshes, bogs, meadows, talus slopes, and cliffs.

While some forest management practices reduce long term productivity by causing soil erosion or loss of habitat critical to fish and wildlife species, the desired future condition of the Forest is to maintain integrated ecological functions. For example, timber management activities such as clearcutting, roading, and prescribed burning alter the natural appearing landscape and have adverse impacts on the water quality, soil productivity, and interior forest habitat values. These impacts will be reduced by riparian protection standards, use of Best Management Practices for road construction, retention of snags and large down woody material in harvest units, and protection of large tracts of older forest habitat distributed within the managed forest landscape. In visual corridors, long-term effects of management activities will be avoided or mitigated to meet landscape management objectives.

The Preferred Alternative (W) provides management direction for the Forest for the next ten years. The management area prescriptions and standards and guidelines (S&Gs) specified in the Forest Plan are designed to ensure long-term productivity. These S&Gs will be monitored to ensure that long-term productivity of the Forest ecosystems will be maintained or improved. Details of the monitoring program are found in Chapter IV of the Forest Plan.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This Section addresses the irreversible and irretrievable commitments of resources which would be involved in the Preferred Alternative (W).

An "irreversible loss of resources" results from a decision to use or modify non-renewable resources such as cultural resources or minerals, or resources that are renewable only over a long period of time. Measures to protect natural resources that could be irreversibly affected by management practices are incorporated in Forest-wide S&Gs of the Final Forest Plan and in the mitigation measures discussed in Chapter IV of the FEIS.

The irreversible disturbance of some types of cultural artifacts and sites is likely as a consequence of management activities. This would be especially true for subsurface sites that cannot be located through surface surveys. Even with mitigation, unanticipated or unavoidable disturbances can result in the loss of cultural values.

The removal of mineral or energy resources is an irreversible loss of resources. The utilization of rock resources for road construction would be an example. Actual commitment of mineral resources on the Forest will depend upon demand and mining industry exploration and development proposals.

In unroaded areas, development activities such as timber harvesting and road construction associated with harvest, recreation, or other purposes, will irreversibly reduce the potential amount of area that could be designated as a part of the National Wilderness Preservation System, managed as a Research Natural Area, or managed for other purposes requiring natural characteristics.

An irreversible loss also occurs when stands of old-growth and mature timber are harvested or removed for the construction of roads, campgrounds, ski runs, or other purposes. Old-growth stands provide key wildlife habitat and are also valued for ecological and esthetic reasons. Because old-growth stands take over 200 years to develop, the commitment of this resource to certain uses is reversible only over a long period of time.

High intensity fires can also cause irreversible losses to soil productivity by causing loss of soil structure, volatilization of nutrients, and accelerated soil erosion.

An irretrievable commitment of resources is a use of resources that is lost because of land management objectives. This represents opportunities foregone for the time that the resource cannot be used. Under multiple-use management some irretrievable commitments of resources are unavoidable due to the mutually exclusive relationship between some resources.

An irretrievable commitment of resources is the loss of timber management opportunities within designated Wilderness or other areas where timber production is prohibited or restricted. Another is the loss interior, old growth forest habitat where the management objective for an area is maximizing wood fiber production.

Some long-term uses of the land cause an irretrievable loss of soil productivity. Examples of these uses include the establishment of arterial and collector roads, administrative sites, and/or developed recreation sites.

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Implementation of the Preferred Alternative (W) on the Forest will result in some adverse environmental effects which cannot be avoided. The application of the management prescription (S&Gs) is intended to limit the extent and duration of these effects. Mitigation is reflected in the management prescriptions and mitigation measures are discussed within each section in Chapter IV of this document. Although the formulation of the Preferred Alternative (W) included avoidance of potential adverse environmental effects, some adverse impacts to the environment which cannot be completely mitigated are expected to occur.

Some adverse effects are of a transitory type. For example, air quality will diminish on a recurring though temporary basis, due to the use of prescribed fire. Most significant impacts will be from burning of debris resulting from timber harvest. Even though S&Gs require prescribed burning to be scheduled for times when weather conditions will provide for smoke dispersion, the presence of smoke and haze over or adjacent to the Forest will detract from people's expectation of clean air. Timber hauling and recreation traffic on untreated roads, and the operation of internal combustion engines, will have localized and temporary adverse effects on air quality where these activities occur.

The natural landscape will appear altered by timber harvest, particularly where logging activity is highly visible from travel routes. Burning of harvest units, and their blackened appearance will also be apparent. These adverse effects will eventually be reduced by growth of vegetation. Other impacts on the natural appearance of the landscape include roads and structures which are highly visible despite efforts to blend them with land forms and mitigate the effect by landscaping.

In unroaded areas, development activities such as timber harvesting, and road construction associated with harvest, recreation, or other purposes will have an adverse effect on the potential future management of these areas as designated Wilderness, as Research Natural Areas, or for other purposes requiring natural characteristics.

Disturbance, displacement, or loss of fish and wildlife may occur as a consequence of habitat loss and increased human activity in project areas. Roads and their associated use impact fish and wildlife due to human activities associated with new access into areas previously unroaded. Improved access into areas that previously had low standard roads would have similar effects.

Both the amount and distribution of mature and old-growth stands will be reduced through implementation of the Preferred Alternative (W). Since some wildlife species rely on habitat conditions provided by old-growth stands, a reduction in the populations of some wildlife species can be expected. As old-growth and mature timber stands are converted to young conifer plantations, the capability of the Forest to provide optimal cover for deer and elk will be reduced.

Ground disturbing activities will temporarily increase silt loads in some streams. This could displace fish, reduce anadromous and resident fish reproductive success, and alter aquatic invertebrate populations. In addition, a loss of fish habitat will occur at road crossings of streams. The portion of a stream bed occupied by a culvert or other structures will be lost as fish habitat.

Mineral and energy development may have unavoidable adverse effects on other resources. The scope of these impacts depends upon the location and type of activity proposed by industry. The approving of operating plans for locatable minerals and requiring surface resource stipulations for leasable minerals, will assist in the management and mitigation of these activities.

Fire hazard and resistance to control will increase subsequent to timber harvest and thinning operations as a result of increased accumulations of forest residues. Wildfire risk will increase where access results in more people using an area during and after management activities. Some of this risk will be mitigated by early detection, suppression, and prevention programs. Long-term increases in fuel hazard will be mitigated through fuels management activities that are responsive to resource management objectives.

Adverse effects will result from increasing recreation use and intensive Forest management activities such as timber harvest, road construction and maintenance, developed recreation, and development of other facilities. These adverse effects include disturbance to native vegetation; soil compaction; reduced water quality; increases in noise levels; disturbance to wildlife populations and their habitat; air pollution from campfire smoke, prescribed fire, and vehicle exhaust; and increased potential for human conflict.

PREPARERS

Interdisciplinary Team

The following is a listing of the Interdisciplinary Team members. These are the current members of the core group and other primary participants. Information regarding qualifications (education and experience) and involvement in the preparation of the Forest Planning Documents is included.

Kenneth Adee, GIS Coordinator

Education: B.A. Philosophy; M.F. Forestry; Post graduate studies in Quantitative Ecology.

Experience: 14 years with Forest Service as Research Forester; Sale Preparation Forester; Planning Team's applications programmer; developed the software for the PLOT-7 mapping system.

Role: Provided GIS analysis of vegetative inventory and old growth acreage estimates.

Rolf Anderson, Planning and Programming Staff Officer

Education: B.S. Forest Management/Forestry; M.S. Management.

Experience: 32 years with Forest Service as Timber Management Assistant; Oregon Dunes NRS Ranger Program Analyst; Planning Staff Officer.

Role: Managed the overall Willamette N.F. land and resource management program since 1981.

Norm Barrett, Assistant Biologist

Education: B.A. Botany/Zoology; B.S. Wildlife Biology.

Experience: 9 years with Forest Service as wildlife biologist and technician.

Role: Assisted in the analysis of wildlife data and documention.

Margaret Beilharz, Hydrologist

Education: B.S. Ecosystems Analysis.

Experience: 12 years with Forest Service in Silviculture; District Hydrologist; Assistant Forest Hydrologist.

Role: Adapted analysis methodology for water and soil resources. Provided evaluation of water quality, soil productivity effects.

Elaine Bernat, Cartographic/Planning Technician

Education: B.A. Art; B.L.A./M.L.A. Landscape Architecture.

Experience: 10 years in landscape architecture, graphics, and mapping systems. Assisted in the preparation of the Willamette National Forest 1979/80 viewshed study. Assisted in the development of the data base graphics production and computer maps for use in the DEIS and Forest Plan since 1981.

Role: Assisted in the data management of mapping systems used for Forest Plan documents. Provided graphics support for final documents.

Sara Buckmaster, Transportation Planner

Education: B.S.C.E., Graduate Study in Forest Engineering.

Experience: 10 years with Forest Service as Civil Engineer; Forest Transportation Planner.

Role: Provided technical input as transportation system and effects.

Brad Burmark, Supervisory Operations Research Analyst

Education: B.S. Forest and Range Management, M.S. Forest and Range Management.

Experience: 10 years with Forest Service as Operations Research Analyst, Supervisory Operations Research Analyst. Provided economic analysis and budgets for FEIS and Forest Plan.

Role: Overall coordination of FORPLAN, Implan, and GIS input to planning process.

Peter Eberhardt, Cartographic/Planning Technician

Education: B.S. Geography 1981.

Experience: 8 years with Forest Service as Resource Data Manager (development of the PLOT-7 mapping system).

Role: Managed mapping system and Forest database used to develop the Forest Plan and analysis of alternatives. Coordination production of Forest Plan maps.

Neal Forrester, Strategic Planner

Education: B.S.F., Forest Management; M.S., Forest Management.

Experience: 15 years with Forest Service as Timber Sale Administrator, Silviculturist, Timber Planner, and Planning Team Leader.

Role: Interdisciplinary Team Leader, provided overall leadership and coordination in the development and preparation of the Forest Plan documents.

Miles Hemstrom, Area VI Ecologist

Education: B.A. Biology; Ph.D. Plant Ecology.

Experience: 10 years with Forest Service as Area Ecologist on Willamette and Siuslaw NFs.

Role: Provided input on analysis of vegetative data for old growth determinations and effects of alternatives on ecological systems.

David Hicks, Writer/Editor

Education: B.S. Forest Management/Forestry.

Experience: 20 years with Forest Service in Timber Management, Planning, and Land Management Planning.

Role: Developed analysis of resource effects on roadless areas in Appendix C of FEIS.

Dave Hill, Planning Records Coordinator

Education: B.A.; J.D.

Experience: 10 years with Forest Service as Law Clerk and Land Law Examiner; Personnel Management Specialist; Claims Specialist; Supervisory Program Analyst.

Role: Assisted in documentation of public comments and responses in FEIS. Responsible for planning records systems.

Al Johnson, Forester

Education: B.S. Forest Management.

Experience: 12 years with Forest Service and Bureau of Land Management in land management planning, timber sale preparation and administration, and hydrology.

Role: Provided technicial support for resource data computer analysis, assisted in documentation of water and soil resources.

Charlene R. Johnson, Editorial Assistant and Document Coordination

Education:	College course work in office skills, technical document editing, and computer systems.
Experience:	11 years with Forest Service in timber data processing and editing technical documents.
	23 years in private industry as bookkeeper, office manager, secretary.
Role:	Coordinated document preparation and editing for FEIS.

Robert Longcore, Landscape Architect

Education:	B.S. Landscape Architecture; M.L.A. Landscape Architecture.
Experience:	20 years as Landscape Architect; 4 years Assistant Professor, School of Environmental Design; 16 years with Forest Service in landscape design and recreation management.
Role:	Provide overall input for recreation, visual management and in Forest Planning process. Coordinated input for Wilderness, roadless areas; Wild and Scenic Rivers, and cultural resources for FEIS.

James Mayo, Timber Planner

Education:	B.S. Forest Management/Forestry.
Experience:	16 years with Forest Service as Presale, Silviculture, and Planning Forester; Timber Planning Assistant.
Role:	Adopted methods for timber yields and inventory in Forest Plan modeling. Provided analysis of timber program and vegetation effects in Forest Plan documents.

Allison Reger, Operations Research Analyst

Education:	B.S. Forest Management/Forestry; M.S. Multiresource Management.
Experience:	2 years with Forest Service as operations research analyst.
Role:	Assisted in developing and evaluating FORPLAN model. Used Implan to develop economic inputs used in FEIS.

Patti Rodgers, Public Affairs Specialists

Education:	Undergraduate work in Fine Arts and Sociology; Social Psychology.
Experience:	20 years with Forest Service in Fire, Timber, Silviculture positions including activities at District and Forest levels.
Role:	Coordinated content analysis of public comments on DEIS, produced newsletters for public updates during development of the Forest Plan.

Mike Scanlon, Operations Research Analyst

Education:	B.S. Forest Management; M.S. Forest Economics.
Experience:	6 years with Forest Service in fire/fuels management and silviculture. 3 years as Operations Research Analyst.
Role:	Responsible for developing and running FORPLAN model for analysis displayed in FEIS.

Steven P. Smith, Wildlife Biologist

Education:	B.S. Science and Range Management.
Experience:	10 years with Forest Service as wildlife biologist.
Role:	Adapted methods for analyzing wildlife resource evaluations in the FEIS including big game, Threatened and Endangered Species, and spotted owl.

Gerald W. Williams, Sociologist

Education:	B.S. Sociology; M.S. General Studies Social Science; Ph.D Sociology.
Experience:	11 years with Forest Service as Sociologist. Involvement in the planning process includes the analysis of social-economic values.
Role:	Provided analysis of social effects in FEIS.

FOREST MANAGEMENT TEAM

Forest Supervisor - Michael A. Kerrick

Deputy Forest Supervisor - Mike Edrington

District Rangers

Lynn Burditt - Blue River
David F. Alexander - Detroit
Rick Scott - Lowell
Randy A. Dunbar - McKenzie
Robert Barstad - Oakridge
Herbert L. Wick - Rigdon
Karen Barnette - Sweet Home

Forest Staff Officers

Rolf Anderson - Planning and Programming
Gloria Brown - Public Affairs
Richard Grace - Recreation
Hank Kashdan - Administration
Harold Legard - Watershed/Soil/Range/Wildlife
Bob Leonard - Timber Management
James Mattiazzi - Engineering
Eurial Turner - Fire and Lands

Other Contributors To FEIS

Mary Bowdon - Writer/Editor
Mandy Cole - Writer/Editor
Joan Cully - Document Preparation
Carl Davis - Cultural Resources
Karen Engelhardt - Graphics Assistance
Reino Jarvi - Document Preparation
Daryl Larson - Computer Assistant
Sue Leatherwood - Document Preparation
Hubert Mapes - Fire/Fuels Management
Roy McNary - Computer Assistant
David O'Guinn - Writer/Editor, Document Production
Mike Ragan - Map production
Susan Sater - Wilderness Management
Del Skeesick - Fisheries Biologist

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GLOSSARY

Many of the definitions in this glossary are referenced to the following sources. The sources are identified by a number in parentheses following the definition. This number corresponds to the list below. Some other terms will be referenced to Forest Service Manuals (FSM), Forest Service Handbooks (FSH), or other sources which are too numerous to list. Finally, many other definitions are not referenced, but are those in general use on the Forest.

SOURCE LIST

(1) 36 CFR 219 National Forest Management Act Regulations.
(2) Regional Guide for the Pacific Northwest Region, 1984.
(3) SAF Dictionary of Forestry Terms, 1971.
(4) The Random House College Dictionary, Revised Edition, 1975.
(5) Webster's New International Dictionary, 1957.
(6) Wildland Planning Glossary, 1976.
(7) Webster's Third New International Dictionary, 1981.
(8) Wildlife Habitats in Managed Forests, The Blue Mountains of Oregon and Washington, 1979.
(9) A Glossary of Terms Used in Range Management.
(10) Forest Service Manual or Forest Service Handbook.

A

Abnormally heavy storms - Storms with a 10- to 100-year return period. That is, a 10-year storm occurs on the average of once every 10 years, a 20-year storm occurs on the average of once every 20 years, and so forth.

Access - Usually refers to a road or trail route over which a public agency claims a right-of-way for public use; a way of approach. (4)

Acquired lands - Lands added to the National Forest system by purchase, transfer, or donation under authority of the Weeks Law or related acts. Also, lands obtained by the Forest Service by exchange for other acquired lands.

Acre equivalent - When applied to habitat improvement or improvement structures, this term reflects overall habitat benefits derived. It reflects the zone of influence of the habitat improvement for the target species. For example, a single water development for upland game birds occupies very little space but has an acre equivalent of 160 because it serves 160 acres of bird habitat. A single water structure for big game has a value of 640 because it has a larger zone of influence for the more mobile big-game animals.

Acre-foot - A measure of water or sediment volume, equal to the amount which would cover an area of one acre to a depth of one foot (i.e., 43,560 cubic feet or 325,851 gallons). (6)

Activity - An action, measure or treatment undertaken that directly or indirectly produces, enhances, or maintains forest and rangeland outputs, or achieves administrative or environmental quality objectives (FSM 1309, Management Information Handbook). An activity can generate multiple outputs. (2)

Activity fuels - Fuels generated or altered by a management activity. (10)

Administrative unit - An area under the administration of one line officer, such as a District Ranger, Forest Supervisor, or Regional Forester. (6)

Age class - An interval, usually 10 to 20 years, into which the age ranges of vegetation are divided for classification or use. (3)

Age group distribution - Age class distribution; the location and/or proportionate representation of different age classes in a forest. (3)

Airshed - A geographic area that, because of topography, meteorology, and climate, shares the same air. (2)

Allocation - See *Land use allocation* or *Resource allocation*.

Allotment - See *Range allotment*.

Allowable sale quantity (ASQ) - The quantity of timber that may be sold, from the area of suitable land covered by the Forest Plan, for a time period specified by the Plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity." (6) (1)

All terrain vehicle (ATV) - A vehicle characterized by its ability to negotiate most kinds of terrain, by virtue of traction devices such as wide tracks, large, low-pressure rubber tires and/or four-wheel drive.

Alternative - One of several policies, plans, or projects proposed for decision making. (2) (10)

Amenity - An object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. The terms "amenity values" or "amenity resources" are typically used in land management planning to describe those resources for which monetary values are not or cannot be established (such as clean air and water, or scenic quality).

Anadromous Fish - Those species of fish that mature in the sea and migrate into streams to spawn. Salmon, steelhead, and searun cutthroat trout are examples.

Analysis area - A delineated area of land subject to analysis of: (1) responses to proposed management practices in the production, enhancement, or maintenance of forest and rangeland outputs and environmental quality objectives, and (2) economic and social impacts. (FSM 1905) Tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed in the FORPLAN model. (SEIS Appendix B, Section entitled Analysis Areas)

Analysis of the Management Situation (AMS) - A determination of the ability of the planning area to supply goods and services in response to society's demand for those goods and services. (1)

Animal Unit Month (AUM) - The amount of forage required by one mature (1,000 lb.) cow or its equivalent for one month (based upon average forage consumption of 26 lbs. dry matter per day). (6)

Animal Month is one month's use and occupancy of the range by one animal. For grazing fee purposes, it is a month's use and occupancy of range by one weaned or adult cow with or without calf, bull, steer, heifer, horse, burro, or mule, or 5 sheep or goats. Forage consumption by other animals is converted to AUM's from animal months by the following factors:

mature cow	=	1.0 AUM	mature sheep	=	.2 AUM
one horse	=	1.2 AUM's	cow/calf	=	1.32 AUM
ewe/lamb	=	.3 AUM			

Annual sale quantity - The quantity of timber that may be sold annually from the area of suitable land covered by the Forest Plan.

Anomalies - A deviation from the common rule, type, or form. An incongruity or inconsistency. (4)

Appropriated Funds - Monies authorized by an act of Congress which permit Federal agencies to incur obligations and to make payments out of the U.S. Treasury for specified purposes.

Aquatic ecosystems - Stream channels, lakes, marshes or ponds, and the plant and animal communities they support.

Aquifer - A geological formation or structure that contains water in sufficient quantity to supply needs for water development. (6)

Artifact - An object made or modified by humans. (4)

Assigned values - Monetary values given to nonmarket resources, based on estimates from comparable market transactions. For example, the benefits of dispersed recreation are given assigned monetary values for their production.

Available forest land - Land which has not been legislatively or administratively withdrawn by the Secretary of Agriculture or Forest Service Chief from timber production.

Average Daily Traffic (ADT) - The average 24-hour volume of traffic, being the total volume of traffic during a stated period divided by the number of days in that period. (6)

B

Background - In visual management terminology, refers to the visible terrain beyond the foreground and middleground where individual trees are not visible, but are blended into the total fabric of the stand. Also a portion of a view beyond three to five miles from the observer, and as far as the eye can detect objects. (6)

Bald Eagle Management Areas (BEMA's) - Areas managed for the protection of the threatened and endangered bald eagle. BEMA's provide nesting and roosting habitat for the bird on each plot.

Basal area - The area of the cross-section of a tree stem near the base, generally at breast height and inclusive of bark. (3)

Base sale schedule - A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity. (This definition expresses the principle of nondeclining flow.) (1)

Basic resource - One of the principal resources; a resource upon which the production of other resources is dependent; e.g., the production of vegetation is dependent upon basic resources such as soils and water.

Benchmark - The analytical basis from which the alternatives were developed. The use of assessed land capability as a basis from which to estimate the effects of alternative patterns of management on the land. (6)

Benchmark - Reference points that define the bounds within which feasible management alternatives can be developed. Benchmarks may be defined by resource output or economic measures.

Benefit (Value) - Inclusive terms used to quantify the results of a proposed activity, project or program expressed in monetary of nonmonetary terms. (10) Also:

1. *Direct benefit.* A primary benefit that responds to specified objectives of the policy, program, project, or expenditure. (10)

2. *Induced benefit.* A primary benefit that is incidental to the objectives of the policy, program, project, or expenditure. (10)

3. *Primary benefit.* A benefit accruing to resource owners from a primary output and that may be direct or induced or may be a residual asset. Primary benefits are components of net public benefits. (10)

4. *Secondary benefit.* A benefit accruing to parties other than the resource owners, including effects on local, Regional, and national economies and on consumers of outputs. Secondary benefits are not necessarily included in net public benefits. (10)

Benefit/Cost ratio - A measure of economic efficiency computed by dividing total discounted primary benefits by total discounted economic costs. (10)

Best Management Practices - A practice or combination of practices that is determined by a State (or designated areawide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation, to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals (Federal Register, Volume 40, No. 230 dated 11/28/75).

Big game - Large mammals hunted for sport. On the National Forest these include animals such as deer, elk, antelope, and bear. (8)

Big game summer range - A range, usually at higher elevation, used by deer and elk during the summer. Summer ranges are usually much more extensive than winter ranges. (8)

Big game winter range - A range, usually at lower elevation, used by migratory deer and elk during the winter months; usually more clearly defined and smaller than summer ranges. (8)

Biological control - A method to control insect populations or tree diseases through the use of applied technology. Also used in noxious plant control. (3)

Biological Growth Potential - The average net growth attainable in a fully stocked natural forest stand. (1)

Biological potential - The maximum production of a selected organism that can be attained under optimum management. (8)

Biomass - The total quantity (at a given time) of living organisms of one or more species per unit of space (species biomass), or of all the species in a biotic community (community biomass).

Board foot (BF) - The amount of wood equivalent to a piece of wood one foot by one foot by one inch thick. (3)

Board foot/cubic foot conversion ratio - Both board foot and cubic foot volumes can be determined for timber stands. The number of board feet per cubic foot of volume varies with tree species, diameter, height, and form factors. A specific factor by species is applied to the cubic foot FORPLAN outputs to give board foot estimates.

Broadcast Burn - Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of fuel hazard or as a silvicultural treatment, or both.

Browse - Twigs, leaves, and young shoots of trees and shrubs on which animals feed; in particular, those shrubs which are used by big game animals for food. (6)

Brush - A growth of shrubs or small trees usually of a type undesirable to livestock or timber management.

Bureau of Land Management (BLM) - An agency within the Department of the Interior, with land management responsibility for the Public Domain lands.

Buyback and Defaulted Timber Sales - In 1984, the Federal Timber Payment Modification Act was enacted by Congress. It allowed private companies to return timber sales not economical to harvest after payment of a fee to the government. The sales returned under the conditions of this Act are

known as "buyback" sales. A timber sale is considered "defaulted" if it is not in compliance with the terms of the contract by the contract termination date. Defaulted sales are also returned to the government.

C

Cable logging - Refers to methods used to skid or pull logs to a central landing or collection area by a cable connected to a remote power source. (6)

Canopy - The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth. (3)

Capability - The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at given levels of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease. (1)

Capability area - Geographic delineations used to describe characteristics of the land and resources in integrated forest planning. Capability areas may be synonymous with ecological land units, ecosystems, or land response units. (10)

Capital formation - As used in IMPLAN is defined as the value of purchases from sectors both inside and outside the Region used by individuals, governments, and industries in the area as investment (land, plant, and equipment used in production processes). (10)

Capital Investment - An input that increases the stock of natural or manmade resources (assets) needed to maintain or increase the flow of outputs in the future. Benefits resulting from capital investments are normally recouped in excess of 1 year. (10)

Capital investment - Activities that create or improve capital assets to obtain benefits occurring during several planning periods. (10)

Carrying capacity - 1) The number of organisms of a given species and quality that can survive in, without causing deterioration of, a given ecosystem through the least favorable environmental conditions that occur within a stated interval of time. 2) In recreation, refers to the number of people that can occupy an area for a given social and experience goal. 3) In range, refers to the maximum stocking rate possible on a given range without causing deterioration to vegetation or related resources. (3)

Cavity - The hollow excavated in trees by birds or other natural phenomena; used for roosting and reproduction by many birds and mammals. (2)

Channel or Stream Scour - Erosion of the channel bottom caused by high flows of water, loss of channel stability, or debris torrents.

Characteristic landscape - In reference to the USDA Forest Service visual management system; the overall impression created by a landscape's unique combination of visual features (land, vegetation, water, structures), as seen in terms of form, line, color and texture; synonymous with "visual landscape character." (6)

Chargeable Volume - All timber volume included in the growth and yield projections for the selected management prescriptions used to arrive at the allowable sale quantity, based on regional utilization standards. (10)

Clearcutting - The cutting method that describes the silviculture system in which the old crop is cleared over a considerable area at one time. Regeneration then occurs from (a) natural seeding from adjacent stands, (b) seed contained in the slash or logging debris, (c) advance growth, or (d) planting or direct seeding. An even-aged forest usually results. (3)

Climatic regimes - A generalized climatic classification which applies to a specific land area; generally that area can be expected to experience that kind of climate in any given year.

Climax - The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition. (6)

Climax Species - Those species that dominate a climax stand in either numbers per unit area or biomass.

Closure - An administrative order restricting either location, timing, or type of use in a specific area.

Coastal Douglas-Fir Zone - The area west of the crest of the Cascade Mountain Range in the States of Oregon and Washington.

Code of Federal Regulations (CFR) - A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. (1)

Coho Smolt - Young coho salmon which are ready to migrate to the sea.

Commercial Forest Land - Land that is producing, or is capable of producing, crops of industrial wood and (1) has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; (2) land where existing technology and knowledge is available to ensure timber production without irreversible damage to soil productivity or watershed conditions; and (3) land where existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be obtained within 5 years after final harvesting.

Commercial thinning - Any type of tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting. (3)

Commodities - A transportable resource with commercial value; all resource products that are articles of commerce. (6)

Common varieties - Nonmineralized sand, gravel, stone, etc. (See *Mineral materials.*)

Community Cohesion - The degree of unity and cooperation within a community in working toward shared goals and solutions to problems.

Community stability - A community's capacity to handle change without major hardships or disruptions to component groups or institutions. Measurement of community stability requires identification of the type and rate of proposed change and an assessment of the community's capacity to accommodate that level of change. (10)

Compaction - The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

Composite - In reference to planning for special areas under the Land and Water Conservation Act of 1965, an area identified as having unique recreation and/or fish and wildlife values.

Composite Plan - A documented analysis which, at one time was required to justify the use of Land and Water Conservation Funds for acquisition of private lands within a designated composite.

Condition class - 1) Timber: a grouping of timber strata into size-age-stocking classes for Forest planning. 2) Range: one of a series of arbitrary categories used to classify range conditions, usually expressed as excellent, good, fair, or poor. (9)

Congressionally Classified and Designated Areas - Areas that require congressional enactment for their establishment, such as National Wildernesses, National Wild and Scenic Rivers, and National Recreation Areas.

Constraint - In FORPLAN, a limit (either ceiling or floor) which may be placed on the level of inputs to or outputs from a forest.

Consumptive use - A use of resources that permanantly reduces the supply, such as mining. (See also *Nonconsumptive use.*) (6)

Conversion period - The duration of a change from one silvicultural system to another or from one tree species to another. (3)

Core Area - An area (as related to the spotted owl) encompassing at least 300 contiguous acres of old growth suitable for nesting and reproduction. The area consists of a pair's territory, in part, the nest site, and principal roost areas.

Corridor - A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries. (1)

Costs -

1. *Direct cost.* A cost that directly contributes to the production of the primary outputs of an activity, project, or program. (10)

2. *Economic cost.* Total fixed and variable costs for inputs, including costs incurred by other public parties and, if appropriate, opportunity costs and cost savings. (10)

3. *Fixed cost.* A cost that is commited for the time horizon of planning or the decision being considered. Fixed costs include fixed ownership requirements, fixed protection, short-term maintenance, and long-term planning and inventory costs. (10)

4. *Investment cost.* A cost of creating or enhancing capital assets, including costs of administrative or common-use transport facilities and resource management investments. (10)

5. *Joint cost.* A cost contributing to the production of more than one type of output. (10)

6. *Non-Forest Service cost.* A cost of investment and operating activities paid by cooperators or other non-Forest Service agencies which are part of Forest Service management programs, or which contribute to the outputs included in the analysis. (10)

7. *Opportunity cost.* The value of a resource's foregone net benefits in its most economically efficient alternative use. (10)

8. *Unit cost or cost per unit.* Total cost of production divided by the number of units produced. (10)

9. *Variable cost.* A cost that varies with the level of controlled outputs in the time horizon covered by the planning period or decisions being considered. (10)

Cost, Capital Investment - The cost of manmade structures, facilities, or improvements in natural resources used as inputs in production processes to produce outputs over one or more planning periods. (FSM 1905)

Cost effective - Achieving specified outputs or objectives under given conditions for the least cost. (6)

Cost efficiency - The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values, but are achieved at specified levels in the least costly manner. Cost efficiency is usually measured using present net value, although use of benefit-cost ratios and internal rate-of-return may be appropriate. (1)

Cost sensitivity analysis - A type of analysis done to estimate how a particular problem's solution would change if the costs were increased or decreased.

Council on Environmental Quality (CEQ) - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters. (Abstracted from the National Environmental Policy Act of 1969, as Amended.)

Cover/forage ratio - The mixture of cover and forage areas on a unit of land, expressed as a ratio. The optimum cover/forage mix for deer on summer range is 60:40.

Created opening - An opening in the Forest created by the silvicultural practices of: final removal harvest of shelterwood; clearcutting; seed tree cutting; or group selection cutting. (2)

Crown height - In a standing tree, the vertical distance from ground level to the base of the crown, measured either to the lowest live branch whorl, or to the lowest live branch (excluding shoots arising spontaneously from buds on the stem of a woody plant), or to a point halfway between. (3)

Cubic foot (CF) - The amount of timber equivalent to a piece of wood one foot by one foot by one foot. (3)

Culmination of mean annual increment (CMAI) - The age at which average annual growth is greatest for a stand of trees. Mean annual increment is expressed in cubic feet measure, and is based upon expected growth according to the management intensities and utilization standards assumed in

accordance with 36 CFR 219.16(a)(2)(i) and (ii). Culmination of mean annual increment includes regeneration harvest yields and any additional yields from planned intermediate harvests. (10)

Cultural resource - The remains of sites, structures, or objects used by humans in the past--historic or prehistoric. (2)

Cumulative effects or impacts - Cumulative effect or impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7 - these regulations use effects and impacts synonymously.)

Cutting cycle - The planned lapse of time between successive cuttings in a stand. (6)

D

Data - Any recorded measurements, facts, evidence, or observations reduced to written, graphical, tabular, or computer form. The term implies reliability, and therefore provides an explanation of source, type, precision and accuracy. (6)

Debris Slide - A shallow landslide of soil, rock, and organic material that occurs on steep slopes.

Debris Torrent - A large debris slide that is charged with water and confined to a steep stream channel. Debris torrents may travel several thousand feet.

Decadent (stands) - Decaying; deteriorating. (4)

Decision Criteria - Essentially the rules or standards used to evaluate alternatives. They are measurements of indicators that are designed to assist a decision maker in identifying a preferred choice from an array of possible alternatives.

Deer winter range - See *Big game winter range.*

De facto outputs - Resource outputs produced from lands not necessarily being managed or allocated for the specific production of these outputs. De facto resource outputs are most commonly recreation and wildlife opportunities. For example, an area may not be allocated to emphasize recreation management and, in fact, may be scheduled for timber harvest in a later decade. However, the area can usually continue to provide recreation opportunities until it is entered for harvesting.

De facto supply - In dispersed recreation, those acres that are available for timber harvests but not entered.

Deferred rotation - Deferred grazing; deferred utilization; withholding livestock from a range to allow the forage to reach a certain stage of growth, stocking, and vigor for those species that govern utilization. (3)

Demand - The amount of an output that users are willing to take at a specified price, time period, and condition of sale. (10)

Demand Analysis - A study of the factors affecting the schedule of demand for an output, including the price-quantity relationship, if applicable. (10)

Department of Energy (DOE) - A department of the Executive branch of the Federal Government which oversees national matters involving the development and use of energy.

Departure - A schedule which deviates from the principle of nondeclining flow by exhibiting a planned decrease in the timber sale and harvest schedule at any time in the future. (10)

Dependent communities - Communities whose social, economic, or political life would change in important respects if market or nonmarket outputs from the National Forests were substantially decreased.

Designated Area (Air Quality) - Those areas delineated in the Oregon and Washington Smoke Management Plans as principal population centers of air quality concern.

Design standard - Approved design and construction specifications used mainly for recreation facilities and roads--includes specified materials, colors, dimensions, etc.

Desirable Residual Vegetation - The remaining vegetation after application of harvest cutting methods that meets management area objectives. The vegetation may be trees, shrubs, grass, or a combination.

Developed recreation - Recreation that requires facilities that, in turn, result in concentrated use of an area. Examples of developed recreation areas are campgrounds and ski areas; facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings. (2)

Developed recreation site - Relatively small, distinctly defined areas where facilities are provided for concentrated public use; e.g., campgrounds, picnic areas, swimming areas, and downhill ski areas. (6)

Diameter at breast height (d.b.h.) - The diameter of a tree measured 4 feet 6 inches above the ground. (6)

Discount rate - An interest rate that represents the cost or time value of money in determining the present value of future costs and benefits. A "real" discount rate is one adjusted to exclude the effects of inflation. (6) (10)

Discounting - An adjustment, using a discount rate, for the value of money over time so that costs and benefits occurring in the future are reduced to a common time, usually the present, for comparison. (6) FSM 1905

Dispersed recreation - A general term referring to recreation use outside developed recreation sites; this includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross-country skiing, and recreation in primitive environments. (2)

Distance zone - One of three categories used in the Visual Management System to divide a view into near and far components. The three categories are: (1) foreground, (2) middleground, and (3) background.

Diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan. (2) (1)

Douglas-Fir Type - An association of tree species in which Douglas-fir is recognized as one of the principal seral species.

Draft Environmental Impact Statement (DEIS) - The draft statement of environmental effects which is required for major federal actions under Section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review. (6)

Dry Ravel - The slow to very rapid gravity driven movement of dry soil. Dry ravel usually occurs when the organic materials in the surface few inches of the soil are severely altered by fire. Dry ravel is most likely where soils are medium to coarse textured and slopes are over 60% gradient.

Duff - Organic matter in various stages of decomposition on the floor of the forest. (4)

E

Early forest succession - The early stage or condition of a plant community that occurs during its development from bare ground to climax. (6)

Economic efficiency - The usefulness of inputs (costs) to produce outputs (benefits) and effects when all costs and benefits that can be identified and valued are included in the computations. Economic efficiency is usually measured using present net value, though use of benefit-cost ratios and rates-of-return may sometimes be appropriate. (10)

Economic growth - Increased economic output in real terms over time. (6)

Economic impacts -

1. *Direct economic impact.* Effects caused directly by forest product harvest or processing or by forest uses. (10)

2. *Indirect economic impact.* Effects that occur when supporting industries sell goods or services to directly affected industries. (10)

3. *Induced economic impact.* Effects that occur when employees or owners of directly or indirectly affected industries spend their income within the economy. (10)

Ecosystem - An interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems. (2)

Edge - An area where plant communities meet or where successional stages or vegetation conditions within the plant communities come together. (2)

Effects - Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused

by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in this FEIS are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or healthy effects, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial. (40 CFR 1508.8, 2)

Electronic sites - Areas designated for the operation of equipment which transmits and receives radio signals (excluding television aerials and antennas) for individual pickup of programming, and passive reflectors.

Employment - Labor input into a production process, measured in the number of person-years or jobs. A person-year is 2,000 working hours by one person working year long or by several persons working seasonally. (10)

Endangered species - Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act. (6)

Ending Inventory Constraint - The standing volume left in the inventory at the end of the planning horizon. The constraint insures that there is enough standing inventory at the end of the planning horizon to perpetuate long-term sustained yield capacity harvest levels on a nondeclining flow basis.

Environmental Analysis - A comprehensive evaluation of alternative actions and their predictable short- and long-term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. (2)

Environmental Assessment - The concise public document required by the regulations for implementing the procedural requirements of the National Environmental Policy Act. (40 CFR 1508.9, 2)

Environmental Impact Statement (EIS) - A statement of the environmental effects of a proposed action and alternatives to it. It is required for major federal actions under Section 102 of the National Environmental Policy Act (NEPA), and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal. (6)

Environmental Protection Agency (EPA) - An agency of the Executive Branch of the Federal Government which has the responsibility for environmental matters of national concern.

Ephemeral draw - A drainage way which conveys surface water for short periods of time in direct response to snowmelt or rainfall runoff.

Erosion - (1) The wearing away of the land surface by running water, wind, ice, or other geologic agents, including such processes as gravitation creep; or (2) detachment and movement of soil or rock

fragments by water, wind, ice, or gravity. The following terms are used to describe different types of erosion:

Accelerated Erosion - Erosion which is much more rapid than natural erosion, with the increase in erosion rate resulting primarily from the influence of human activities, or, in some cases, of other events that expose mineral soil surfaces, such as wildfire.

Gully erosion - The erosion process whereby water accumulates in narrow channels, and over short periods, removes the soil from this narrow area to considerable depths, ranging from 4 inches to as much as 75 to 100 feet.

Rill erosion - An erosion process in which numerous small channels less than 4 inches deep and 6 inches wide are formed.

Sheet erosion - The removal of a fairly uniform layer of soil from the land surface by runoff water.

Estuary - A semiclosed body of water which has a free connection with the open sea. The sea water in an estuary is measurably diluted with fresh water from streams, rivers, or ground water.

Eutrophic - Of habitats, particularly soils and water, that are rich or adequate in nutrients. (3)

Even-aged management - The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands. (1)

Even-aged stands - Stands in which all trees are of about the same age. (A spread of 10 to 20 years is generally considered one age class.) Cutting methods producing even-aged stands are clearcut, shelterwood, or seed tree systems.

Exchange reserved - Lands which have been added to the National Forest System by exchange under the General Exchange Act for reserved/proclaimed National Forest System Lands.

Existing visual condition (EVC) - An inventory of existing visual impacts as seen from sensitive travel corridors or use areas; measures visual changes to the landscape caused by natural or human activities.

Exports - As used in IMPLAN are defined as outputs or products produced but not consumed or used in production of other outputs in the impact area. Includes both exports to other areas of the U.S. and international exports. (10)

Extensive Forest Management - A low investment level of management on regulated timberlands that requires initial harvest, regeneration, and final harvest. Some precommercial thinning may be done to prevent stagnation and disease buildup.

Extirpation - Eradication; extermination. (5)

F

Fault - A ground surface fracture or fracture zone along which there has been a displacement of one side with respect to the other. (6)

Fault scarp - An abrupt change in surface elevation resulting from earthquake activity. Fault scarps may vary from as little as a few inches to two or three thousand feet.

Fawn rearing habitat - Areas used regularly by female deer for fawn raising; optimum fawning habitat includes low shrubs or small trees under an overstory of about 50% closure, usually located on slopes of less than 15 percent where vegetation is succulent and plentiful in June, and water is available within 183 meters. (8)

Feral - Non-native species, or their progeny, which were once domesticated but have since escaped from captivity and are now living free. (6)

Final cut - See *Final removal harvest.*

Final Environmental Impact Statement - The final version of the statement of environmental effects required for major federal actions under section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement to include public and agency responses to the draft. (6)

Final removal harvest - The removal of the last seed bearers or shelter trees after regeneration is established under a shelterwood system. (6)

Fire management - All activities required for protection of resources from fire and for the use of fire to meet land management goals and objectives. (6)

Fisheries habitats - Streams, lakes, and reservoirs that support fish populations.

Flood plain - The lowland and relatively flat area adjoining inland waters, including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year. (2)

Forage - All browse and nonwoody plants that are available to livestock or game animals and used for grazing or harvested for feeding. (6)

Forb - Any herb other than grass. (7)

Foreground - A term used in visual management to describe the portions of a view between the observer and up to 1/4 to 1/2 mile distant. (6)

Forest and Rangeland Renewable Resources Planning Act of 1974 - An Act of Congress requiring the preparation of a program for the management of the National Forests' renewable resources, and

the preparation of land and resource management plans for units of the National Forest System. It also requires a continuing inventory of all National Forest System lands and renewable resources. (6)

Forest land - Land at least 10 percent occupied by forest trees or formerly having had such tree cover and not currently developed for nonforest use. Lands developed for nonforest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearings and powerline clearings of any width. (1) (10)

Forest Program - A forest program is the summary or aggregation of project or activity information that makes up an integrated (multifunctional) course of action for a given level of funding on a National forest that is consistent with the Forest plan.

Forest-Range Environmental Study (FRES) levels - Various range management intensities developed to reflect the degree of range utilization. FRES levels measure the amount of native forage available to livestock for consumption under these different intensities. Developed in a Forest Service report entitled "The Nation's Range Resources -- A Forest-Range Environmental Study," Forest Resources Report No. 19.

Forest Service Handbook (FSH) - For Forest Service use, directives that provide detailed instructions on how to proceed with a specialized phase of a program or activity. (10)

Forest Service Manual (FSM) - A system of manuals which provides direction for Forest Service activities.

Forest system roads - Roads that are part of the Forest development transportation system, which includes all existing and planned roads as well as other special and terminal facilities designated as Forest development transportation facilities. (See arterial roads, collector roads, and local roads.)

Forest Type - A classification of forest land based upon the tree species presently forming a plurality of basal area stocking in live trees.

Formally dedicated area - An area of the Forest set aside for a specific use by virtue of a formal ceremony or congressional designation.

FORPLAN - A linear programming system used for developing and analyzing forest planning activities. (10)

Free-to-Grow - A term used by silviculturists to indicate that trees are free of growth restraints, the most common of which is competing over-topping vegetation.

Fuel break - A zone in which fuel quantity has been reduced or altered to provide a position for suppression forces to make a stand against wildfire. Fuel breaks are designated or constructed before the outbreak of a fire. Fuel breaks may consist of one or a combination of the following: natural barriers, constructed fuel breaks, constructed barriers. (6)

Fuel management - The practice of planning and executing the treatment or control of living or dead vegetative material in accordance with fire management direction. (10)

Fuel treatment - The rearrangement or disposal of natural or activity fuels (generated by management activity, such as slash left from logging) to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire.

Fuels - Combustible wildland vegetative materials. While usually applied to above ground living and dead surface vegetation, this definition also includes roots and organic soils such as peat. (10)

Full-service management - Management of developed recreation sites to furnish the full range of amenities and maintenance for the public enjoyment. Management objectives are based on site capacity, site protection needs, seasonal demands for public use, and desired levels of service to enhance visitor's experience and convenience and provide optimum maintenance.

Furbearing species - See *Game species*.

G

Game species - Any species of wildlife or fish for which seasons and bag limits have been prescribed and which are normally harvested by hunters, trappers, and fishermen under state or federal laws, codes, and regulations. (6)

Genetic seedlings - Tree seedlings from a genetically superior seed source. The seeds are collected from trees displaying exceptional form and raised in nurseries before outplanting. The seedlings usually have faster growth rates than naturally regenerated seedlings.

Geomorphology - The science that deals with land and submarine relief features of the earth's surface and seeks a genetic interpretation of them, using the principles of physiography in its descriptive aspects and dynamic and structural geology in its explanatory phases. (6)

Geothermal - Of or pertaining to the internal heat of the earth. (4)

Goal - A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed. (2) (1)

Goods -

1. *Nonmarket good*. An output that is not normally exchanged for money in a market. Usually no market has evolved because ownership of the good is not clear, exclusive use is not possible under current laws, or it is not possible to consistently define good. (10)

2. *Public good*. An output for which it is impractical to impose a charge, either because it must be supplied to all if it is supplied to one or because the costs of collection and control exceed likely revenue. (10)

Goods and services - The various outputs, including on-site uses, produced from forest and rangeland resources. (2,1)

Grass/forb - An early forest successional stage where grasses and forbs are the dominant vegetation.

Group selection cutting - See *Uneven-aged silvicultural systems.*

Growing season - That part of the year when temperature and moisture are favorable for vegetation growth.

Guideline - An indication or outline of policy or conduct; i.e., any issuance that assists in determining the course of direction to be taken in any planned action to accomplish a specific objective. (2)

Guzzler - A device for collecting and storing precipitation for use by wildlife or livestock. Consists of an impenetrable water collection area, a storage facility, and a trough from which animals may drink. (9)

H

Habitat - The place where a plant or animal naturally or normally lives or grows. (2)

Habitat Capability - The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish or plant population. It is measured in terms of potential population numbers.

Habitat diversity - The distribution and abundance of different plant and animal communities and species within a specific area.

Hardwood - A broad-leaved flowering tree.

Harvest Cutting Method - A combination of interrelated actions whereby forests are tended, harvested, and replaced. The combination of management practices used to manipulate the vegetation results in forests of distinctive form and character. Harvest cutting methods are classified as even-aged and uneven-aged.

Harvest dispersion (factor) - The dispersion of cutting units over the land base in order to meet clearcut size limitations, or other resource constraints. An example of a harvest dispersion constraint is: no more than 25 percent of an analysis area may be harvested in one decade.

Headwaters - The upper tributaries of a river. (4)

Herbaceous - An adjective describing seed-producing plants that do not develop persistent woody tissue, but die down to ground level at the end of the growing season.

Hiding cover - Vegetation that will hide 90 percent of an adult deer or elk from the view of a human at a distance of 200 feet or less. The distance at which the animal is essentially hidden is called a "sight distance."

High-site timbered lands - A relative measure of resource productivity.

Historic site - Site associated with the history, tradition, or cultural heritage of national, state, or local interest, and of enough significance to merit preservation or restoration. (6)

Hydrology - The scientific study of the properties distribution and effects of water in the atmosphere, on the earth's surface, and in soil and rocks.

I

ID Team - See *Interdisciplinary team.*

Impacts - See *Effects.*

IMPLAN - A computer-based system used by the Forest Service for constructing nonsurvey input/output models to measure economic input. The system includes a data base for all countries in the U.S. and a set of computer programs to retrieve data and perform the computational tasks for input/output analysis. (10)

Imports - As used in IMPLAN are defined as purchases of products for use in production of other products and for final consumption from outside the impact area. Includes both imports from other areas of the U.S. and international imports. Competitive imports are the same as local domestic products which are not produced in quantities sufficient to meet local demands or which obtain a share of the local market formerly supplied by local producers. Noncompetitive imports are products not produced locally. (10)

Improved genetic stock - Group of plants (trees) that have been improved genetically (4).

Income - Employee compensation, profits, rents, and other payments to households. (10)

Indicator species - See *Management indicator species.*

Indirect outputs - Outputs caused by an action, but which are later in time or farther removed in distance, although still reasonably foreseeable. (See *Effects.*)

Individual (single) tree selection - See *Uneven-aged silvicultural systems.*

Induced outputs - Outputs in the private sector induced by the direct outputs produced on the Forest. (6)

Influence zone - See *Zone of influence.*

Input/output analysis - A quantitative study of the interdependence of a group of activities, based on the relationship between inputs and outputs of the activities. The basic tool of analysis is an input-output model for a given period that shows simultaneously for each economic sector the value of inputs and outputs, as well as the value of transactions within each economic sector. It has especially been applied to estimate the effects of changes in Forest output levels on local economic activity. (3)

Instream flows - A prescribed level (or levels) of streamflow, usually expressed as a stipulation in a permit authorizing a dam or water diversion, for the purpose of meeting National Forest System management objectives.

Integrated pest management - A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated population on various resource values, alternative regulation tactics and strategies, and benefit/cost estimates of those alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system, and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable. (2) (1)

Integrated resource management - A management strategy which emphasizes no resource element to the exclusion or violation of the minimum legal standards of others. (FSM 1905)

Intensive grazing management - Grazing management that controls distribution of cattle and duration of use on the range, usually by fences, so parts of the range are rested during the growing season. (See also *Quality extensive management*; *Quality intensive management*.)

Intensive management (intensive forest management) - A high investment level of timber management
that includes use of precommercial thinnings, commercial thinnings, genetically improved stock, and control of competing vegetation. (2)

Interdisciplinary Team (ID Team) - A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. (6)

Intermediate cutting - Any removal of trees from a stand between the time of its formation and the regeneration cut. Most commonly applied intermediate cuttings are release, thinning, improvement, and salvage. (6)

Intermingled Ownerships - Lands within the National Forest boundaries or surrounded by National Forest lands that are owned by private interests or other government agencies.

Intermittent Stream - A stream that runs water in most months, but does not run water during the dry season during most years.

Interpretive services - Visitor information services designed to present educational and recreational values to Forest visitors to enhance their understanding, appreciation, and enjoyment of the Forest.

Intertie - A link between two points, objects, or concepts. (5)

Inventory data and information collection - The process of obtaining, storing, and using current inventory data appropriate for planning and managing the Forest. (6)

Irretrievable - Applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible. (10)

Irreversible - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options. (10)

Issue - A point, matter, or question of public discussion or interest to be addressed or decided through the planning process. (See also *Public issue.*) (2)

L

Land and Water Conservation Fund (L&WCF) - Funds collected from sales of surplus Government real property, motorboat fuels taxes, recreation use fees, etc. which are available to purchase and develop certain qualifying lands for recreational purposes.

Land class - The topographic relief of a unit of land. Land classes are separated by slope, which coincides with the timber inventory process. The three land classes used in the Fremont National Forest Plan are defined by the following slope ranges: 0 to 40 percent; 40 to 60 percent; and greater than 60 percent.

Land exchange - The conveyance of nonfederal land and/or interests in exchange for National Forest System land or interests in land.

Landform - An area of that is defined by its particular combination of bedrock and soils, erosion processes and climatic influences.

Landing - Any place where round timber is assembled for further transport, commonly with a change of method. (3)

Land management - The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions. (6)

Landownership pattern - The National Forest System resource land base, in relation to other land ownerships within given boundaries. (2)

Landscape management - The art and science of planning and administering the use of Forest lands in such ways that the visual effects maintain or upgrade human psychological welfare. The planning and design of the visual aspects of multiple-use land management.

Lands Not Appropriate for Timber Production - Includes lands that: 1) are proposed for resource uses that preclude timber production, such as Wilderness; 2) have other management objectives that limit timber production to the point where management requirements set forth in CFR 219.27 cannot be met; or, 3) are not cost efficient over the planning horizon in meeting forest objectives including timber production. (1)

Lands Not Suited (Unsuitable) for Timber Production - Includes lands that: 1) are not forest land as defined in CFR 219.3; 2) are likely, given current technology, to suffer irreversible resource damage to soils productivity, or watershed conditions; 3) cannot be adequately restocked as provided in 36 CFR 219.27(c)(3); or, 4) have been withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service. In addition, Forest lands other than those that have been identified as not suited for timber production shall be reviewed and assessed prior to formulation of alternatives to determine the costs and benefits of a range of management intensities for timber production. (1)

Lands Suitable for Timber Production - Includes all lands not classified as either Not Suited or Not Appropriate for Timber Production.

Landtype - A portion of the Forest mapped in the Siuslaw National Forest Soil Resource Inventory that has a defined arrangement of specific landforms that reacts to management activities in generally predictable ways. Landtypes range from 60 to 600 acres in size.

Landtype Association - A group of landtypes that make up a large portion of the Forest. The landtypes are sufficiently homogeneous to be considered as a whole for modeling the future outputs and effects of planned management activities. Landtype Associations do not usually follow watershed boundaries and are defined on the basis of general similarities in geology, climate, landform and vegetation. Landtype Associations on the Forest range in size from 14,000 to 93,000 acres.

Land use allocation - The commitment of a given area of land or a resource to one or more specific uses--for example, to campgrounds or wilderness. (6)

Leasable minerals - Coal, gas, oil, phosphate, sodium, potassium, oil shale, sulphur, geothermal steam. Also includes other minerals on acquired National Forest Lands. (6)

Least-cost analysis - Determination of the least cost means of attaining specified results. (10)

Level IV Law Enforcement Officer - A Forest Service employee who has graduated from the Federal Law Enforcement Academy and holds a law enforcement commission signed by the Regional Forester. District Level IV officers generally perform other duties as well as law enforcement.

Lifestyle - The characteristic way people live, indicated by consumption patterns, work, leisure, and other activities. (10)

Linear programming - A mathematical method used to determine the cost-effective allocation of limited resources between competing demands when both the objective (e.g., profit or cost) and the restrictions on its attainment are expressible as a system of linear equalities or inequalities. (6)

Locatable minerals - Those hardrock minerals which can be obtained by filing a claim on Public Domain or National Forest System lands reserved from the Public Domain. In general, the locatable minerals are those hardrock minerals which are mined and processed for the recovery of metals, but may also include certain nonmetallic minerals and uncommon varieties of mineral materials. (6)

Logging residues - See *Slash*.

Long-term sustained yield timber capacity (LTSY) - The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity, consistent with multiple-use objectives. (1)

M

Management Area - An area with similar management objectives and a common management prescription. (1) (10)

Management concern - An issue, problem, or condition which influences the range of management practices identified by the Forest Service in the planning process. (1)

Management direction - A statement of multiple use and other goals and objectives, and the associated management prescriptions, and standards and guidelines for attaining them. (1)

Management emphasis - That portion of a management scheme which receives the most stress or is of the greatest significance or importance. It may be the resources being produced, or it may be the way in which they are produced.

Management indicator species - A species selected because its welfare is presumed to be an indicator of the welfare of other species using the same habitat. A species whose condition can be used to assess the impacts of management actions on a particular area. (8)

Management Information Handbook (MIH) Codes - An accounting system that labels each Forest activity or budget item with a code to identify that activity in a consistent manner. Normally used for budgeting purposes.

Management intensity - The management practices or combination of management practices and associated costs to obtain different levels of goods and services (1). In FORPLAN management prescriptions, a set of activities designed to accomplish a particular management emphasis (see also *Management prescriptions*).

Management practice - A specific activity, measure, course of action, or treatment. (1)

Management prescription - The management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives (1). In FORPLAN, the combination of a management emphasis and associated management intensities with a variety of timing choices for implementation. (2)

Management Requirement (MR) - Minimum standards for resource protection, vegetation manipulation, silvicultural practices, even-aged management, riparian areas, soil and water diversity, to be met in accomplishing National Forest System goals and objectives. (1)

Marginal timber component - Timber on which the income just equals or could just equal the costs of production under a given form of management. (3)

Market - The processes of exchanging a good or service for money or other goods or services according to a customary procedure. A market may occur in a specific place or throughout an area by individual transactions. (10)

Market area - The area from which a market draws or to which it distributes its goods or services and for which the same general price structure and price influences prevail. (10)

Market value - The unit price of an output normally exchanged in a market after at least one stage of production. Market value is expressed in terms of prices as evidenced by market transactions. (10)

Mass movement - A general term for any of the variety of processes by which large masses of earth material are moved downslope by gravitational forces - either slowly or quickly. (6)

Mature timber - Trees that have attained full development, particularly height, and are in full seed production. (3)

Maximum modification - See *Visual quality objective.*

Mean annual increment of growth - The total volume of a tree or stand of trees up to a given age divided by that age. (2)

Mesotrophic - Habitats, particularly soil and water, of moderate nutrient capacity. (3)

Middleground - A term used in visual management to describe the portions of a view extending from the foreground zone out to 3 to 5 miles from the observer. (6)

Mineral entry - The filing of a mining claim upon public domain or related land to obtain the right to any minerals it may contain. (6)

Mineral entry withdrawal - The exclusion of mining locations and mineral development work on areas required for administrative sites by the Forest Service and other areas highly valued by the public. (6)

Mineral materials - Deposits such as sand, stone, gravel, and clay. (6)

Mineral soil - Weathered rock materials usually containing less than 20 percent organic matter. (6)

Minimum level management - FORPLAN term designating lands that will not be actively managed for timber or forage production. Often, these are lands that have high costs and low benefits associated with their management.

Minimum streamflows - A specified level of flow through a channel that must be maintained by the users of streams for biological, physical, or other purposes.

Mining claim - A portion of the public lands which a miner, for mining purposes, takes and holds in accordance with mining laws. (6)

Mitigation - Mitigation includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or elimination the impact over time by preservation and maintenance operations during the life of the action; and, (e) compensating for the impact by replacing or providing substitute resources or environments. (40 CFR Part 1508.20)

Mitigation measures - Actions to avoid, minimize, reduce, eliminate, or rectify adverse impacts of management practices.

Model - A representation of reality used to describe, analyze, or understand a particular concept. A "model" may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. (6)

Modification - See *Visual quality objective.*

Monitoring and evaluation - The periodic evaluation of Forest Plan management practices on a sample basis to determine how well objectives have been met.

Mortality - In wildlife management, the loss in a population from any cause, including hunter kill, poaching, predation, accident, and disease. In forestry, trees in a stand that die of natural causes. (8)

Mountain pine beetle - A tiny black insect, ranging in size from 1/8 to 3/4 inch, that bores its way into a tree's cambium and cuts off its supply of nutrients, thus killing the tree.

Multiple Use - The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land and with consideration being given to the relative values of the various resources; and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output. (1)

Multiplier - A ratio of a measure of total change in income or employment to the direct income or employment change. The measure to total change may be direct plus indirect change (Type I Multipliers); or direct, indirect, and induced change (Type II Multipliers); or direct, indirect, and interactive increased induced demands based on population increase (Type III Multipliers). (10)

Municipal Watershed - A watershed which provides water for human consumption, where Forest Service management could have a significant effect on the quality of water at the intake point, and that provides water utilized by a community or any other water system that regularly serves: 1) at least 25 people on at least 60 days in a year, or 2) at least 15 service connections. In addition to cities, this includes campgrounds, residential developments, and restaurants. (10)

N

National Direction - Statements of missions, goals, and objectives that guide Forest Service planning. (FSM 1905)

National Environmental Policy Act (NEPA) of 1969 - An Act to declare a National policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality. (The Principal Laws Relating to Forest Service Activities, Agriculture Handbook No. 453, USDA, Forest Service, 359 pp.)

National Forest Land and Resource Management Plan - A Plan which ". . . shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits in an environmentally sound manner." (1)

National Forest Management Act (NFMA) - A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.

National Forest Systems (NFS) - All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608)

National Recreation Trails (NRT) - Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the National system of trails authorized by the National Trails System Act. National Recreation Trails provide a variety of outdoor recreation uses. (6)

National Register of Historic Places - A listing (maintained by the U.S. National Park Service) of areas which have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the Nation. (6)

National Wilderness Preservation System - All lands covered by the Wilderness Act and subsequent Wilderness designations, regardless of the governmental department having jurisdiction.

Natural barrier - A natural feature that restricts livestock or wildlife movements, such as a dense stand of trees or a cliff.

Natural regeneration - Reforestation of a site by natural seeding from the surrounding trees. Natural regeneration may or may not be preceded by site preparation.

Net Cash Flow - The difference between the annual receipts of an alternative and costs required to implement that alternative.

Net public benefits - An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield. (1)

Net Receipts - Receipts minus costs.

Net returns to the Treasury, Net cash flow - The difference between the total dollar receipts projected for an alternative and the total budget required to implement the alternative.

Nitrogen-Fixing (Nitrogen Fixation) - Conversion of free nitrogen by plants such as red alder into combined forms useful in nutrient cycles and other functions in the biosphere.

No Action Alternative (Alt. A) - This alternative is the "No Action" alternative required by the National Environmental Policy Act. It analyzes the effects of continuing management under direction established by the Fremont National Forest's 1979 Timber Resource Management Plan, using updated timber resource inventories and yield tables. Acres formerly allocated to old growth and stream-side management are replaced by Management Requirement plots in Alternative A, as mandated by the National Forest Management Act of 1976.

No Change Alternative (Alt. NC) - This alternative would implement the Fremont National Forest Timber Resource Management Plan as provided through the 1978 Klamath Basin Working Circle and the 1979 Lakeview Federal Sustained Yield Timber Resource Final Environmental Impact Statements, using the yield tables and timber resource inventories developed for this 1979 Plan. This alternative does not include all management requirements and would not meet the intent of the National Forest Management Act of 1976.

Nominal value - A monetary value relative to time that does not account for the effects of inflation.

Nonchargeable volume - All volume not included in the growth and yield projections for the selected management prescriptions used to arrive at the allowable sale quantity. (FSH 2409.13)

Noncommodity outputs - Resource outputs that are not normally bought and sold, or cannot be bought and sold, such as air quality or scenic beauty.

Nonconsumptive use - That use of a resource that does not reduce the supply. For example, nonconsumptive use of water includes hydroelectric power generation, boating, swimming, and fishing. (2)

Nondeclining flow - Where the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity. (1)

Nonforest land - Lands that never have had or that are incapable of having 10 percent or more of the area occupied by forest trees; or lands previously having such cover and currently developed for nonforest use. (6)

Nongame species - Animal species which are not hunted, fished, or trapped.

Nonmarket value - The unit price of a nonmarket output normally not exchanged in a market at any stage before consumption; it is thus necessary to impute nonmarket value from other economic information. (10)

Nonmarket valued outputs - Assessed value of a goods or service which is not traded in the market place and has no market value. Because it is not bought and sold, some measure other than price must be used in establishing the value. (6)

Nonpoint source pollution - Pollution whose source is general rather than specific in location. It is widely used in reference to agricultural and related pollutants-- for example, production of sediments by logging operations, agricultural pesticide applications, or automobile exhaust pollution. (6)

Nonpriced outputs - Nonpriced outputs are those for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value. Subjective nondollar values are given to nonpriced outputs.

No Surface Occupancy - A clause used in mineral leases to prevent activities in sensitive areas. Sometimes results in closure of an area and sometimes has little impact if directional drilling can tap resources underlying restricted area.

Noxious weeds - Undesirable plant species that are unwholesome to the range or to animals. (6)

O

Objective - A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals. (1)

Off-road vehicle (ORV) - Vehicles such as motorcycles, all-terrain vehicles, four-wheel drive vehicles, and snowmobiles. (2)

Old-growth deficit - A forest without the excess volume of mature/overmature old-growth trees that could be used to offset reductions in programmed harvest volume resulting from allocation changes.

Old-growth habitat - Habitat for certain wildlife that is characterized by overmature coniferous forest stands with large snags and decaying logs.

Old-growth stand (old growth) - Any stand of trees 10 acres or greater generally containing the following characteristics: 1) contain mature and overmature trees in the overstory and are well into the mature growth stage; 2) will usually contain a multilayered canopy and trees of several age classes; 3) standing dead trees and down material are present; and 4) evidences of man's activities may be present, but do not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand. (2)

Oligotrophic - Lakes characterized by a low accumulation of dissolved nutrient salts, supporting only sparse plant and animal life, and having a high oxygen content, owing to the low organic content. (4)

Open to entry - With respect to minerals management, lands available to occupy under the mining laws.

Operational costs - Those costs associated with administering and maintaining National Forest facilities and resource programs.

Operational Plan - A document approved by the Forest Supervisor which specifies at the project level, implementation of the management direction established in the Forest Plan. (6)

Opportunity - A proposal that is considered in developing alternative activities, projects or programs where an option exists to invest profitably to improve or maintain a present condition.

Output - A good, service, or on-site use that is produced from forest and rangeland resources. See FSH 1309.11 for forest and rangeland outputs codes and units measure. Examples: X06-Softwood Sawtimber Production MBF; X80-Increased Water Yield - Acre Feet; W01-Primitive Recreation Use RVD's. (FSM 1905)

Output, Market - A good, service, or on-site use that can be purchased at a price. (FSM 1905)

Output, Nonmarket - A good, service, or on-site use not normally exchanged in a market. (FSM 1905)

Overbid - To bid more than the appraised value. (4)

Overgrazing - Continued overuse (year after year) creating a deteriorated range.

Overgrazed Range - A range that has deteriorated and may still be deteriorating from its productive potential due to overgrazing.

Overmature timber - The stage at which a tree declines in vigor and soundness, for example, past the period of rapid height growth. (2)

Overstory - That portion of the trees, in a Forest or in a stand of more than one story, forming the upper or uppermost canopy. (3)

Overuse (overutilization) - Utilizing an excessive amount of the current year's growth which, if continued, will result in overgrazing and range deterioration.

Overwood removal - A harvest method that removes the overstory of a two-story stand and leaves the smaller understory for further treatment (thinning or harvesting).

P

Partial Cut - Covers a variety of silvicultural practices where a portion of the stand is removed and a portion is left.

Partial retention - See *Visual quality objective.*

Particulates - Small particles suspended in the air and generally considered pollutants. (See *Total Suspended Particulates.*) (5)

Perennial stream - A stream that flows year round.

Permittee - Any person or business formally allowed to graze livestock on the land of another person or business (e.g.; on state or federal land). (3)

Personal use - Normally used to describe the type of permit issued for removal of wood products (firewood, post, poles, and Christmas trees) from National Forest land when the product is for home use and not to be resold for profit.

Persons-at-one-time (PAOT) - A recreation capacity measurement term indicating the number of people who can use a facility or area at one time. (2)

Pests - Any animal or plant that, during some portion of its life cycle, inhibits the establishment or growth of some other species of plant or animal favored by man.

Phenology - The science dealing with the influence of climate on the recurrence of such annual phenomena of animal and plant life as bird migrations, budding, etc. (4)

Physiographic province - A Region having a particular pattern of relief features or land forms that differs significantly from that of adjacent Regions. (6)

Planned ignition - A fire started deliberately, and controlled to accomplish a resource management objective.

Planning area - The area of the National Forest System covered by a Regional guide or forest plan. (1)

Planning criteria - Criteria prepared to guide the planning process. Criteria applied to collection and use of inventory data and information, analysis of the management situation, and the design, formulation, and evaluation of alternatives. (1)

Planning horizon - The overall time period considered in the planning process. It spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions (1). In this FEIS and Forest Plan, the planning horizon is considered to be 15 decades.

Planning period - One decade. The time interval within the planning horizon that is used to show incremental changes in yields, costs, effects, and benefits. (1)

Planning records - The body of information documenting the decisions and activities which result from the process of developing a Forest Plan, revision, or significant amendment.

Plan of Operations - A document required from any person proposing to conduct mineral-related activities which utilize earth moving equipment and which will cause disturbance to surface resources or involve the cutting of trees. (36 CFR 228.4)

Pole/sapling - A Forest successional stage in which trees between five and nine inches in diameter are the dominant vegetation. (See also *Size class*.)

Pole timber - Trees of at least five inches in diameter at breast height, but smaller than the minimum utilization standard for sawtimber. (See also *Size class*.)

Policy - A guiding principle upon which is based a specific decision or set of decisions. (FSM 1905)

Potential yield - (*This term is in reference to the 1979 Timber Resource Plan only*.) Optimum sustained yield of timber harvest volume attainable with intensive forestry on available commercial forest land (forest lands able to produce 20 cubic feet of timber per acre per year or more) while considering the interrelationship with other forest resources and uses. Intensive forestry includes planting only with genetic stock, precommercial thinning, commercial thinning and release. Programmable net salvage volume and volume from marginally economical lands are also included (in reference to 155.2 MMBF per year in the 1979 TM Plan).

Practices - Those management activities that are proposed or expected to occur.

Precommercial thinning - The practice of removing some of the trees less than marketable size from a stand so that the remaining trees will grow faster. (2)

Prehistoric site - An area which contains important evidence and remains of the life and activities of early societies which did not record their history.

Preparatory cut - The removal of trees near the end of a rotation, which permanently opens the canopy and enables the crowns of seed bearers to enlarge, to improve conditions for seed production and natural regeneration. Typically done in the shelterwood system. (3)

Prescribed fire - A wildland fire burning under specified conditions which will accomplish certain planned objectives. The fire may result from either planned or unplanned ignitions. Proposals for use of unplanned ignitions for this purpose must be approved by the Regional Forester. (2)

Prescription - A written direction for harvest activities and regeneration methods.

Present net value (PNV) - The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area. (1)

Preservation - A visual quality objective that allows only for ecological changes. (2)

Price - The unit value of an output expressed in dollars. (10)

Price elasticity - A measure of the sensitivity of the quantity of a good or service exchanged to changes in price. (10)

Priced outputs - Priced outputs are those that are or can be exchanged in the market place. The dollar values for these outputs fall into two categories: market or nonmarket (assigned values).

Price-quantity Relationship - A schedule of prices that would prevail in a market for various quantities of the output exchanged. (10)

Price trend analysis - An analysis done to estimate how a particular FORPLAN solution would change if predicted price trends were increased or decreased.

Primitive recreation - Those types of recreational activities associated with unroaded land -- e.g., hiking, backpacking, cross-country travel. (6)

Proclaimed land - Lands reserved from the Public Domain for National Forest purposes by presidential proclamation. (See also *Reserved Land*)

Program - Sets of activities or projects with specific objectives, defined in terms of specific results and responsibilities for accomplishments. (10)

Program Budget - A plan that allocates annual funds, work force ceilings, and targets among agencies. (10)

Program Budget Level - A single, comprehensive integrated program responsive to the Chief's direction that specifies a level of production attainable from a given investment of dollars and other resources. Each budget level represents a complete, full, and independent package within the criteria and constraints identified. (10)

Programmatic Memorandum of Agreement - An agreement between the USDA Forest Service, Pacific Northwest Region, the Oregon State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation on the management of two types of cultural resource sites found on the Forest: Depression-era administrative structures and prehistoric lithic scatters.

Programmed harvest - The amount of timber on the Forest that is scheduled for harvesting. The programmed harvest is based on current demand, funding, and multiple-use considerations.

Project - An organized effort to achieve an objective identified by location, timing, activities, outputs, effects, and time period and responsibilities for executions. (10)

Project Design - The process of developing specific information necessary to describe the location, timing, activities, outputs, effects, accountability, and control of a project.

Public Involvement - A Forest Service process designed to broaden the information base upon which agency decisions are made by (1) informing the public about Forest Service activities, plan, and decisions, and (2) encouraging public understanding about and participation in the planning processes which lead to final decision making. (10)

Public issue - A subject or question of widespread public interest relating to management of the National Forest System. (1)

Public participation - Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service planning. (2)

Public Participation Activities - Meetings, conferences, seminars, workshops, tours, written comments, survey questionnaires, and similar activities designed or held to obtain comments from the general public and specific publics.

Q

Quality extensive management (QE) - Range management based on low operating and investment costs per acre. (3)

Quality intensive management (QI) - Range management to obtain a high production of livestock through the best techniques of range management. (3)

R

Range - Land producing native forage for animal consumption, and lands that are revegetated naturally or artificially to provide forage that is managed like native vegetation. (6)

Range allotment - An area designated for use of a prescribed number and kind of livestock under one management plan. (6)

Range Environmental Assessment (REA) - An environmental assessment to determine the condition of the range with regard to suitability for grazing, vegetative cover types, potential vegetative communities, condition of vegetation, soil stability, and forage production and utilization.

Rangeland - Land on which the climax vegetation (potential natural plant community) is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing and browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain forb and shrub communities. It also includes areas seeded to native or adapted introduced species that are managed like native vegetation.

Range management - The art and science of planning and directing range utilization so as to secure sustained maximum production of livestock, milk, and/or cut forage, consistent with other uses and conserving natural resources. (3)

Raptors - Predatory birds, such as falcons, hawks, eagles, or owls.

Rate of return - The financial yield per unit cost determined as the rate of interest at which total discounted benefits equal total discounted costs. (Internal rate of return is a similar measure appropriate to the benefits and costs that affect private firms or individuals.) (10)

Real dollar value - A monetary value that compensates for the effects of inflation. (1)

Receipts - Those priced benefits for which money will actually be paid to the Forest Service: recreation fees, timber harvest, mineral leases and special use fees.

Receipt shares - The portion of receipts derived from Forest Service resource management that is distributed to State and county governments, such as the Forest Service 25-percent fund payments. (1)

Record of Decision - A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not. (40 CFR 1505.2)

Recreation capacity - The number of people that can take advantage of the recreation opportunity at any one time without substantially diminishing the quality of the experience or the biophysical resources. (2)

Recreation Information Management (RIM) - A computer-oriented system for the organization and management of information concerning recreation use, occupancy, and management of National Forest lands.

Recreation opportunity - The availability of choices for users to participate in the recreational activities they prefer within the settings they prefer.

Recreation Opportunity Spectrum (ROS) - A framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or spectrum divided into seven classes: Primitive, Semiprimitive Nonmotorized, Semiprimitive Motorized, Roaded Modified, Roaded Natural, Rural, Urban.

1. **Primitive** - Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

2. **Semiprimitive Nonmotorized** - Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but would be subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

3. **Semiprimitive Motorized** - Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

4. **Roaded Natural** - Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

Recreation Visitor Day (RVD) - A measure of recreation use, in which one RVD equals twelve visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more persons. (2)

Recreational river - See *Wild and Scenic river.*

Reduced service management - Management of developed recreation facilities below optimum maintenance standards.

Reforestation - The natural or artificial restocking of an area with forest trees. (2)

Regeneration - The renewal of a tree crop, whether by natural or artificial means. Also, the young crop itself, which is commonly referred to as reproduction. (2)

Region - An area covered by a Regional guide. See FSM 1221.3 for organizational definitions. (10)

Regional Forester - The Forest Service official responsible for administering a single Region.

Regional Guide - The guide developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended. It guides all natural resource management activities, and establishes management standards and guidelines for the National Forest System lands within a given Region. It also disaggregates the assigned Regional RPA objectives to the Forests within that Region.

Regulations - Generally refers to the Code of Federal Regulations, Title 36, Chapter II, which covers management of the Forest Service. (2)

Rehabilitation - Action taken to restore, protect, or enhance site productivity, water quality, or other resource values over a period of time.

Release - Freeing trees from competition for light, water, and nutrients by removing or reducing the vegetation growth that is overtopping or closely surrounding them.

Removal cut (final cut) - The removal of the last seed bearers or shelter trees after regeneration is established under a shelterwood method. (6)

Renewable Resources - Resources that are possible to use indefinitely, when the use rate does not exceed the ability to renew the supply.

Renewable Resources Assessment - An appraisal of the Nation's renewable resources that recognizes their vital importance and the necessity for long-term planning and associated program development. The Assessment meets the requirements of Section 3 of the Resources Planning Act and includes analyses of present and anticipated uses, demands, and supplies of the renewable resources; a description of Forest Service programs and responsibilities; and a discussion of policy considerations, laws, and regulations.

Research Natural Area (RNA) - An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. In U.S.D.A. Forest Service usage, Research Natural Areas are areas designated to ensure representative samples of as many of the major naturally-occurring plant communities as possible. (6)

Reserved lands - Lands reserved from the public domain for National Forest purposes, and lands which are added to the National Forest System by exchange for reserved National Forest lands. (See *Proclaimed Land*)

Residual stand - The trees remaining standing after some activity such as selection cutting. (2)

Resource - Anything which is beneficial or useful - be it animal, vegetable, mineral, a location, a labor force, a view, an experience, etc. Resources, in the context of land use planning, thus vary from such commodities as timber and minerals to such amenities as scenery, scenic view points, or recreation opportunities. (6)

Resource allocation - The action of apportioning the supply of a resource to specific uses or to particular persons or organizations. (6)

Resource Allocation Model (RAM) - A mathematical model using linear programming which will allocate land to different management prescriptions and schedule implementation of those prescriptions simultaneously. The purpose of the model is to find a schedule and allocation that meets the goals of the Forest and optimizes some objective function, such as "minimize costs."

Resource Management Plan - A Plan developed prior to the Forest Plan that outlined the activities and projects for a particular resource element independently of considerations for other resources. Such Plans will be superseded by the Forest Plan.

Resource Planning Act (RPA) - The Forest and Rangeland Renewable Resources Planning Act of 1974. Also refers to the National Assessment and Recommended Program developed to fulfill the requirements of the act. (2)

Responsible Line Officer - The Forest Service employee who has the authority to select and/or carry out a specific planning action. (1)

Rest rotation - An intensive system of range management whereby grazing is deferred on various parts of the range during succeeding years, allowing the deferred part complete rest for one year. (6)

Retention - See *Visual quality objective.*

Returns to Counties - The portion of receipts derived from Forest Service resource management that is distributed to State and county governments such as the Forest Service 25 percent fund payments.

Right-of-way (R/W) - An accurately located strip of land with defined width, point of beginning, and point of ending; the area within which the user has authority to conduct operations approved or granted by the landowner in an authorizing document, such as a permit, easement, lease, license, or Memorandum of Understanding. (6)

Riparian - Pertaining to areas of land directly influenced by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas. (3)

Riparian Area - Geographically delineated areas, with distinctive resource values and characteristics, that are comprised of aquatic and riparian ecosystems.

Riparian ecosystem - A transition between the aquatic ecosystem, and the adjacent upland terrestrial ecosystem. Identified by soil characteristics and distinctive vegetation communities that require free or unbound water.

Road - A general term denoting a way for purposes of travel by vehicles greater than 40 inches in width.

1. *Forest Arterial Road.* Provides services to large land areas and usually connects with public highways or other forest arterial roads to form an integrated network of primary travel routes. The location and standard are often determined by a demand for maximum mobility and travel efficiency rather than specific resource management service. It is usually developed and operated for long-term land and resource management purposes and constant service. (10)

2. *Forest Collector Road.* Serves smaller land areas than a forest arterial road and is usually connected to a forest arterial or public highway. Collects traffic from forest local roads and/or terminal facilities. The location and standard are influenced by both long-term multiresource service needs as well as travel efficiency. May be operated for either constant or intermittent service, depending on land use and resource management objectives for the area served by the facility. (10)

3. *Forest Local Road.* Connects terminal facilities with forest collector or forest arterial roads or public highways. The location and standard are usually controlled by specific resource activity requirements rather than travel efficiency needs. (10)

Roaded modified (RM) - A classification of the Recreation Opportunity Spectrum that characterizes a predominately altered environment, allowing for noticeable to strongly-evident management activity.

Roaded natural (RN) - A classification of the Recreation Opportunity Spectrum that characterizes a predominately natural environment with evidence of moderate permanent alterations and resource utilization. Evidence of the sights and sounds of people is moderate, but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from the sights and sounds of people. (2)

Roadless Area - Areas studied during the Roadless Area Review and Evaluation process (RARE II) which are roadless and at least 5,000 acres in size.

Roadless Area Review and Evaluation II (RARE II) - The national inventory of roadless and undeveloped areas within the National Forest and Grasslands. This refers to the second such assessment, which was documented in the Final Environmental Impact Statement of the Roadless Area Review and Evaluation, January 1979. (2)

Rotation - Planned number of years between the formation of a generation of trees and its final harvest at a specified stage of maturity. Appropriate for even-aged management only. (6)

Roundwood products - Logs, bolts, or other round sections cut from trees.

Rural - A Recreation Opportunity Spectrum classification for areas characterized by a substantially modified natural environment. Sights and sounds of people are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide soil and vegetative cover protection.

S

Sale preparation costs - Costs associated with preparing a timber harvest on Forest Service lands for sale to the public; usually include all administrative costs for developing sale layout, writing an Environmental Assessment and selling the timber sale.

Sale schedule - The quantity of timber planned for sale by time period, from the area of suitable land covered by a Forest plan. The first period, usually a decade, of the selected sale schedule provides the allowable sale quantity. Future periods are shown to establish that long-term sustained yield will be achieved and maintained. (1) For planning purposes, the sale schedule and the allowable sale quantity are synonymous for all periods or decades over the planning horizon. (1)

Salvage cuttings - Intermediate cuttings made to remove trees that are dead or in imminent danger of being killed by injurious agents. (10)

Sanitation cuttings - Intermediate cuttings made to remove dead, damaged, or susceptible trees to prevent the spread of pests or pathogens. (10)

Sanitation-salvage treatment - See Salvage cutting; Sanitation cutting.

Satisfactory Range Condition - On suitable range, forage condition is at least fair, with stable trend, and allotment is not classified PC (basic resource damage) or PD (other resource damage).

PC (Basic Resource Damage)

Allotments will be classified as PC when analysis or evaluation indicates that one ore more of the following conditions exist and livestock use on the allotment is or has been a major factor contributing to this condition.

a. Maximum summer water temperatures are elevated above State Standards or other approved criteria on SMU class I or II streams and this is largely due to the loss of shade-producing vegetation in the allotment.

b. Management-induced instability exceeds 20 percent of the total miles of stream (SMU classes I-IV) in an allotment.

c. Gully development of sufficient size to lower the seasonally saturated zone and change the plant community type is occurring.

d. Soil condition rating on 25 percent or more of Key Areas is rated poor or very poor.

PD (Other Resource Damage)

These allotments may or may not have approved allotment management plans (AMP's), but adverse impacts on resources other than the basic soil and water resources are occurring. These impacts are the result of resource management objectives not being met. An allotment will be classified as PD when 10 percent or more of its area meets this criteria. Damage to vegetation is based on use in excess of that planned.

Sawtimber - Trees containing at least one 12-foot sawlog or two noncontiguous 8-foot logs, and meeting regional specifications for freedom from defect. Softwood trees must be at least 9 inches in diameter and hardwood trees 11 inches in diameter at breast height.

Scarified - Land in which the topsoil has been broken up or loosened in preparation for regenerating by direct seeding or natural seedfall. Also refers to ripping or loosening road surfaces to a specified depth for obliteration or "putting a road to bed." (3)

Scenic areas - Places of outstanding or matchless beauty which require special management to preserve these qualities. They may be established under 36 CFR 294.1 whenever lands possessing outstanding or unique natural beauty warrant this classification. (6)

Scenic River Areas - See *Wild and Scenic river.*

Scheduled timber harvests - Volumes and acres programmed for harvest which are within the allowable sale quantity. This does not include salvage and sanitation harvesting.

Scoping process - A part of the National Environmental Policy Act (NEPA) process; early and open activities used to determine the scope and significance of the issues, and the range of actions, alternatives, and impacts to be considered in an Environmental Impact Statement. (40 CFR 1501.7)

Second growth - Forest growth that has become established following some interference, such as cutting, serious fire, or insect attack, with the previous Forest crop. (6)

Sediment - Earth material transported, suspended, or deposited by water. (6)

Seed tree cutting - Removal in one cut of the mature timber from an area, except for a small number of seed bearers left singly or in small groups. (3)

Seedlings and saplings - Live trees less than five inches in diameter at breast height. (See also *Size class.*) (3)

Selection cutting - The annual or periodic removal of trees (particularly mature trees), individually or in small groups, from an uneven-aged forest, to realize the yield and establish a new crop of irregular constitution. (3)

Semiprimitive motorized (SPM) - A classification of the Recreation Opportunity Spectrum, characterized by a predominantly unmodified natural environment in a location that provides good to moderate isolation from sights and sounds of people, except for those facilities/travel routes sufficient to support motorized recreational travel opportunities which present at least moderate challenge, risk, and a high degree of skill testing. (2)

Semiprimitive nonmotorized (SPNM) - A classification of the Recreation Opportunity Spectrum,characterized by a predominately unmodified natural environment of a size and location that provides a good to moderate opportunity for isolation from sights and sounds of people. The area is large enough to permit overnight foot travel within the area, and presents opportunity for interaction with the natural environment with moderate challenge, risk, and use of a high degree of outdoor skills. (2)

Sensitive species - Plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official State list, or that are recognized by the Regional Forester as needing special management to prevent placement on Federal or State lists. (2)

Sensitivity analysis - A determination of the effects of varying the level of one or more factors, while holding the other factors constant. (6) (10)

Sensitivity level - A measure of people's concern for the scenic quality of the National Forests. Three sensitivity levels are employed, each identifying a different level of user concern for the visual environment.

Level 1 - Highest sensitivity
Level 2 - Average sensitivity
Level 3 - Lowest sensitivity (2)

Separate Suitability Components (SSC lands) - Those forested lands tentatively suitable for timber production that grow less than 20 cubic feet per acre per year of timber but have greater than ten percent occupancy (trees cover more than ten percent of the acre).

Sequential Upper and Lower Bounds - A FORPLAN term referring to the constraint that sets upper and lower limits by which harvest levels can increase or decrease from decade to decade. This constraint constitutes a departure from nondeclining flow and allows the harvest to rise or fall by decade according to the bounds that are set. (See *Constraint.*)

Seral - A biotic community which is a developmental, transitory stage in an ecologic succession. (6)

Shelterwood - The cutting method that describes the silvicultural system in which, in order to provide a source of seed and/or protection for regeneration, the old crop (the shelterwood) is removed in two or more successive shelterwood cuttings. The first cutting is ordinarily the seed cutting, though it may be preceded by a preparatory cutting, and the last is the final cutting. Any intervening cutting is termed removal cutting. An even-aged stand results. (3)

Silvicultural examination - The process used to gather the detailed in-place field data needed to determine management opportunities and direction for the timber resource within a small subdivision of a Forest area, such as a stand.

Silvicultural system - A management process whereby Forests are tended, harvested, and replaced, resulting in a Forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of forest thereby produced. (3) (1)

Silviculture - The art and science of controlling the establishment, composition, and growth of forests. (2)

Single-tree selection - See *Individual (single) tree selection.*

Site index - A numerical evaluation of the quality of land for plant productivity, (6) . . .based on the height of dominant trees in a stand at an arbitrarily chosen age. (3)

Site preparation - 1) An activity (such as prescribed burning, disking, and tilling) performed on a reforestation area, before introduction of reforestation, to ensure adequate survival and growth of the future crop; **or** 2) manipulation of the vegetation or soil of an area prior to planting or seeding. The manipulation follows harvest, wildfire, or construction in order to encourage the growth of favored species. Site preparation may include the application of herbicides; burning, or cutting of living vegetation that competes with the favored species; tilling the soil; or burning of organic debris (usually logging slash) that makes planting or seeding difficult.

Site productivity - Production capability of specific areas of land.

Size class - For the purposes of Forest planning, size class refers to the intervals of tree stem diameter used for classification of timber in the Forest Plan data base.

seedling/sapling = less than five-inch diameter
pole/sapling or pole timber = five-inch to nine-inch diameter
sawtimber = greater than nine-inch diameter

Skidding - A general term for hauling loads by sliding, not on wheels, as developed originally from stump to roadside, deck, skidway, or other landing. (3)

Skyline Logging - A system of cable logging in which all or part of the weight of the logs is supported during yarding by a suspended cable.

Slash - The residue left on the ground after tree felling and tending, and/or accumulating there as a result of storm, fire, girdling or poisoning. It includes unutilized logs, uprooted stumps, broken or uprooted stems, the heavier branchwood, etc. (3)

Small game - Birds and small mammals normally hunted or trapped. (2)

Snag - A standing dead tree.

Socioeconomic - Pertaining to, or signifying the combination or interaction of social and economic factors. (2)

Softwoods - Coniferous trees, usually evergreen, having needles or scalelike leaves.

Soil - The portion of the earth's surface consisting of disintegrated rock and humus. (7)

Soil productivity - The capacity of a soil to produce a specific crop such as fiber or forage under defined levels of management. Productivity is generally dependent on available soil moisture and nutrients, and length of growing season.

Soil resource inventory - See *Soil surveys*.

Soil surveys - Systematic examinations of soils in the field and in laboratories; their description and classification; the mapping of kinds of soil; the interpretation according to their adaptability for various crops, grasses, and trees; their behavior under use or treatment for plant production or for other purposes; and their productivity under different management systems. (6)

Soil texture - The relative proportions of the various soil separates in a soil, described by the classes of soil texture. Twelve basic soil texture classes are recognized, such as "loam." The textural classes may be modified by the addition of suitable adjectives when coarse fragments are present in substantial amounts; for example, "stony loam."

Special Interest Areas - Areas managed to make recreation opportunities available for the understanding of the earth and its geological, historical, archeological, botanical, and memorial features. (6)

Special Management Areas (SMA) - Areas of unusual public interest or other significance, e.g.; wilderness, primitive areas, scenic areas, or archeological areas. SMA's do not require formal designation, however, Special Interest Areas do. (10)

Special Use Permit - A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest land for some special purpose.

Stand (tree stand, timber stand) - An aggregation of trees or other vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement, and condition as to be distinguishable from the forest or other vegetation or land cover on adjoining areas. (2)

Stand diversity - Any attribute that makes one timber stand biologically or physically different from other stands. This difference can be measured by, but not limited to: different age classes; species; densities; or non-tree floristic composition.

Stand examination surveys - Procedures to collect data on Forest stands.

Standard - A statement which describes a condition when a job is done properly. Standards show how well something should be done, rather than what should be done. (6)

Standards and Guidelines - Principles specifying conditions or levels of environmental quality to be achieved.

Stocking - The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land.

Stream Blockage - Accumulation of soil, rock, and organic material deposited in a stream channel by landslides that prevent fish from moving upstream.

Stream Buffer - Vegetation left along a stream channel to protect the channel or water from the effects of logging, road building, or other management activity. (see vegetation leave area)

Stream class - Classification of streams based on the present and foreseeable uses made of the water, and the potential effects of on-site changes on downstream uses. Four classes are defined:

> Class I - Perennial or intermittent streams that: provide a source of water for domestic use; are used by large numbers of fish for spawning, rearing or migration; and/or are major tributaries to other Class I streams.
>
> Class II - Perennial or intermittent streams that: are used by moderate though significant numbers of fish for spawning, rearing or migration; and/or may be tributaries to Class I streams or other Class II streams.
>
> Class III - All other perennial streams not meeting higher class criteria.
>
> Class IV - All other intermittent streams not meeting higher class criteria. (10)

Streamflow - The flow of water, generally with its suspended load, down a well-defined water course. (6)

Streamside Management Unit (SMU) - An area of varying width adjacent to a stream where practices that might affect water quality, fish, and other aquatic resources are modified to meet water quality goals, for each class of stream. The width of this area will vary with the management goals for each class of stream, characteristics of the stream and surrounding terrain, and the type and extent of the planned activity.

Stream Structure - The arrangement of logs, boulders, and meanders which modify the flow of water, thereby causing the formation of pools and gravel bars in streams. Generally, there is a direct relationship between complexity of structure and fish habitat. Complex structure is also an indication of watershed stability.

Stumpage (stumpage value) - The value of timber as it stands uncut, in terms of an amount per unit of volume. (6)

Substantive comment - A comment that provides factual information, professional opinion, or informed judgment germane to the action being proposed. (10)

Successional stage - A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax; for example, coniferous forests in the Blue Mountains progress through six recognized stages: grass-forb; shrub-seedling; pole-sapling timber; young timber; mature timber; old-growth timber. (2)

Suitability - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices. (1) (2) (FSM 1905)

Suitable Forest land - Land to be managed for timber production on a regulated basis.

Super pits - Quarry sites that initially contain at least 100,000 cubic yards of better-than-average quality road-surfacing material, usually basalt or andesite.

Supply - The amount of an output that producers are willing to provide at the specified price, time period, and condition of sale.

Supply Schedule (Curve) - A schedule of amounts of an output that producers are willing to provide at a range of prices, at a given point in time and condition of sale. (See Price-Quantity Relationship.)

Suppression - The process of extinguishing or confining fire. (2)

Sustained-Yield of Products and Services - The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land. (1) (6)

T

Technology change - A change in the relationship between inputs and outputs in a production process resulting from the implementation of new technology, or a new application of existing technology. (10)

Tentatively suitable Forest land - Forest land that is producing or is capable of producing crops of industrial wood and: (a) has not been withdrawn by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity, or watershed conditions; (c) existing technology and knowledge, as reflected in current

research and experience, provides reasonable assurance that it is possible to restock adequately within five years after final harvest; and (d) adequate information is available to project responses to timber management activities.

The Nature Conservancy (TNC) - A private organization whose primary function consists of the acquisition of land which The Nature Conservancy believes should be under management by a public agency. The land usually has some specific environmental or conservation value attached to it; such as a piece of land which fits one of the ecological niches identified as needing to be included in the Research Natural Area program, or has some unique values for wildlife management.

Thermal cover - Cover used by animals to ameliorate effects of weather.

Thinning - A felling made in an immature stand primarily to maintain or accelerate diameter increment and also to improve the average form of the remaining trees without permanently breaking the canopy. An intermediate cutting. (3)

Threatened and Endangered (T&E) species - See *Threatened*; see *Endangered*.

Threatened species - Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. (See also Endangered species.) (2)

Tiering - Refers to the coverage of general matters in broader environmental impact statements (such as National program or policy statements) with subsequent narrower statements or environmental analyses (such as Regional or Basin-wide program statements, or ultimately, site-specific statements) incorporating, by reference, the general discussions and concentrating solely on the issues specific to the statement subsequently prepared. (40 CFR 1508.28)

Timber classification - Forest land is classified under each of the land management alternatives according to how it relates to the management of the timber resource. The following are definitions of timber classifications used for this purpose.

1. *Nonforest*--Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

2. *Forest*--Land at least 10-percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

3. *Suitable*--Commercial forest land identified as appropriate for timber production in the forest planning process.

4. *Unsuitable*--Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness) or identified as not appropriate for timber production in the forest planning process.

Timber harvest schedule - See *Sale schedule*.

Timber Management Resource Plan (TM Plan) - A functional resource plan completed in 1979 which established a sale volume to be sold each year based upon an analysis of the most recent resource inventories. This plan was an integrated plan which considered implications to other resources on the Forest.

Timber production - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For purposes of Forest planning, the term "timber production" does not include production of fuelwood or harvest of unsuitable lands. (1) (2)

Timber Sale Program Quantity - The volume of timber planned for sale during the first decade of the planning horizon. It includes the allowable sale quantity (chargeable volume) and any additional material (nonchargeable volume) planned for sale. Expressed as the average for the first decade.

Timber stand improvement (TSI) - Measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, or poisoning of unwanted trees aimed at improving the growing condition of the remaining trees. (2)

Topography - The configuration of a surface including its relief, elevation, and the position of its natural and human-created features. (6)

Total Suspended Particulates (TSP) - Any finely divided material (solid or liquid) that is airborne with an aerodynamic diameter smaller than a few hundred micrometers.

Tractor logging - Any logging method which uses a tractor as the motive power for transporting logs from the stumps to a collecting point--whether by dragging or carrying the logs. (3)

Tradeoff - The combination of benefits and costs which are gained and lost in switching between alternative courses of action. Trade-offs include only those portions of benefits and costs which are not common to all alternative courses of action under consideration. (6)

Transitory range - Land that is suitable for grazing use of a nonenduring nature over a period of time; often found in the openings created by timber harvesting activities. For example, on particularly disturbed lands, grass may cover the area for a period of time before being replaced by trees or shrubs not suitable for forage. (6)

Turbidity - The degree of opaqueness, or cloudiness, produced in water by suspended particulate matter, either organic or inorganic. Measured by light filtration or transmission and expressed in Jackson Turbidity Units (JTU's).

U

Understory - The trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth. (6)

Undeveloped Area - Portion of the National Forest that is essentially unroaded.

Uneven-aged Management - The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. (1)

Uneven-aged silviculture systems - The combination of actions that result in the creation of forests or stands of trees, in which trees of several or many ages grow together. Cutting methods that develop and maintain uneven-aged stands are individual tree and group selecting cutting methods:

> Individual tree selection cutting - The removal of selected trees of all size classes on an individual basis.
>
> Group selection cutting - The removal of all trees in groups for regeneration purposes. The size of the group will be small enough in area that all subsequent regeneration will be influenced by the surrounding uncut stand. Cuts are generally .25 - 2.0 acres in size.

Unplanned ignition - A fire started at random by either natural or human causes, or a deliberate incendiary fire.

Unsatisfactory Range Condition - Allotment does not meet criteria for satisfactory condition. (See Satisfactory Range condition.)

Utility corridor - A strip of land, up to approximately 600 feet in width, designated for the transportation of people, energy, commodities, and communications by: railroad, state highway, electrical power transmission (66 KV and above), and/or oil, gas, and coal slurry pipelines 10 inches in diameter and larger; and telecommunication cable and electronic sites for interstate use. (1)

Utilization standards - Standards guiding the projection of timber yields and the use and removal of timber. The standards are described in terms of minimum diameter at breast height, minimum length, and percent soundness of the wood, as appropriate. (1)

V

Variety Classes - Variety Classes are obtained by classifying the landscape into different degrees of variety. This determines those landscapes which are most important and those which are of lesser value from the standpoint of scenic quality.

The classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic value.

There are three variety classes which identify the scenic quality of the natural landscape:

Class A - Distinctive
Class B - Common
Class C - Minimal

Vegetation Leave Area - Area of land in which vegetation is left undisturbed in order to provide shade and organic debris to streams, or to prevent the acceleration of natural erosion processes. No regulated timber harvest is planned in these areas.

Vegetative management - Activities designed primarily to promote the health of the crop forest cover for multiple-use purposes.

Vertical relief - A contour variation of the land surface perpendicular in relation to the surrounding land. (3) (4)

Viable Population - A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area. (FSM 1905)

Viewshed - Portion of the Forest that is seen from a major travel route, or high use location.

Visual absorption capacity (VAC) - The physical capability of the land to support management activities without significantly affecting its visual character. Rated as high, moderate, and low.

HIGH (H) - High visual capability to absorb change.
MODERATE (M) - Moderate visual capability to absorb change.
LOW (L) - Low visual capability to absorb change.

Visual quality objective (VQO) - Categories of acceptable landscape alteration measured in degrees of deviation from the natural-appearing landscape.

Preservation (P) - Ecological changes only.

Retention (R) - Management activities should not be evident to the casual Forest visitor.

Partial Retention (PR) - Management activities remain visually subordinate to the characteristic landscape.

Modification (M) - Management activities may dominate the characteristic landscape but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Maximum Modification (MM) - Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Enhancement - A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists. (2)

Visual resource - The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors. (2)

W

Water rights - Rights to divert and use water or to use it in place.

Water yield - The measured output of the Forest's streams. (6)

Watershed - The entire land area that contributes water to a drainage system or stream. (6)

Watershed Impact Area - Areas within a watershed that are being affected by harvesting, road building, etc. Impact areas are limited to a percent of the total watershed area by the Standards and Guidelines in Appendix D of the DEIS.

Waterside Management Unit (WMU) - See *Streamside Management Unit.* Identical to SMU, except applies to standing water, i.e., lakes, ponds, reservoirs, etc., rather than streams.

Wetlands - Areas that are inundated by surface or ground water often enough to support, and usually do support, primarily plants and animals that require saturated or seasonally saturated soil conditions for growth and reproduction. (E.O. 11990)

Wild and Scenic river - Those rivers or sections of rivers designated as such by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by an act of the legislature of the state or states through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

1. Wild River Areas - Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

2. Scenic River Areas - Those rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

3. Recreational River Areas - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past. (2) (6)

Wilderness - Areas designated by congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wildernesses are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; are of sufficient size to make practical their preservation,

enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest. (2)

Wildlife and Fish User Day - Twelve visitor hours which may be aggregated continuously, intermittently, or simultaneously by one or more persons.

Wildfire - Any wildland fire that is not a prescribed fire. (See also *Prescribed fire.*) (2)

Withdrawal - A legislative or administrative order removing specific land areas from availability for certain uses.

Wood fiber production - The growing, tending, harvesting, and regeneration of harvestable trees.

Woody Material - Organic materials necessary for stream channel stability and maintenance of watershed condition. It includes large logs and root wads.

Working circle (WC) - A geographic division of the Forest created for administrative or marketing purposes. In this document, the area that is not part of the Lakeview Federal Sustained Yield Unit is sometimes referred to as the Klamath Basin Working Circle and the Lakeview Unit may be referred to as the Lakeview Working Circle. (3)

Working group - A term used for planning purposes to identify and group the major commercial tree species harvested from the Forest. The Fremont National Forest recognizes three working groups: the Pine-Associated working group includes stands of white fir with inclusions of ponderosa pine, incense cedar, lodgepole pine, western white pine, or sugar pine; the Ponderosa Pine working group includes stands which are predominately ponderosa pine; the Lodgepole Pine working group is made up of stands dominated by lodgepole pine. These vegetative classifications are based on the vegetative potential of a site and not necessarily the actual vegetative occupancy of the site. Working groups are further stratified by productivity potential, such as "ponderosa pine-high" and "ponderosa pine-low".

X, Y, Z

Xeric - A dry soil moisture regime. Some moisture is present but does not occur at optimum levels for plant growth. Irrigation or summer fallow is often necessary for crop production. (3)

Yarding - Hauling timber from the stump to a collection point. (2)

Yield tables - Tables that estimate the level of outputs that would result from implementing a particular activity. Usually referred to in conjunction with FORPLAN input or output. Yield tables can be developed for timber volumes, range production, soil and water outputs, and other resources.

Zone of influence - The geographic area whose social, economic and/or environmental condition is significantly affected by changes in Forest resource production or management.

APPENDIX A

ISSUES, CONCERNS, AND OPPORTUNITIES

INTRODUCTION

This appendix discusses the:

- Process used to identify the issues, concerns, and opportunities (ICOs) through publication of the Draft Environmental Impact Statement (DEIS).

- Relationships among resources within and between key issues, human interests affected by varying responses to those key issues, refinements and changing focus of public and internal interest about five key issues during the interval between publication of the DEIS and Final Environmental Impact Statement (FEIS); the location in the FEIS and Land and Resource Management Plan (LRMP) where the issues are addressed; and the indicators which can reasonably be used to judge responsiveness to the issues.

- Consultation with others.

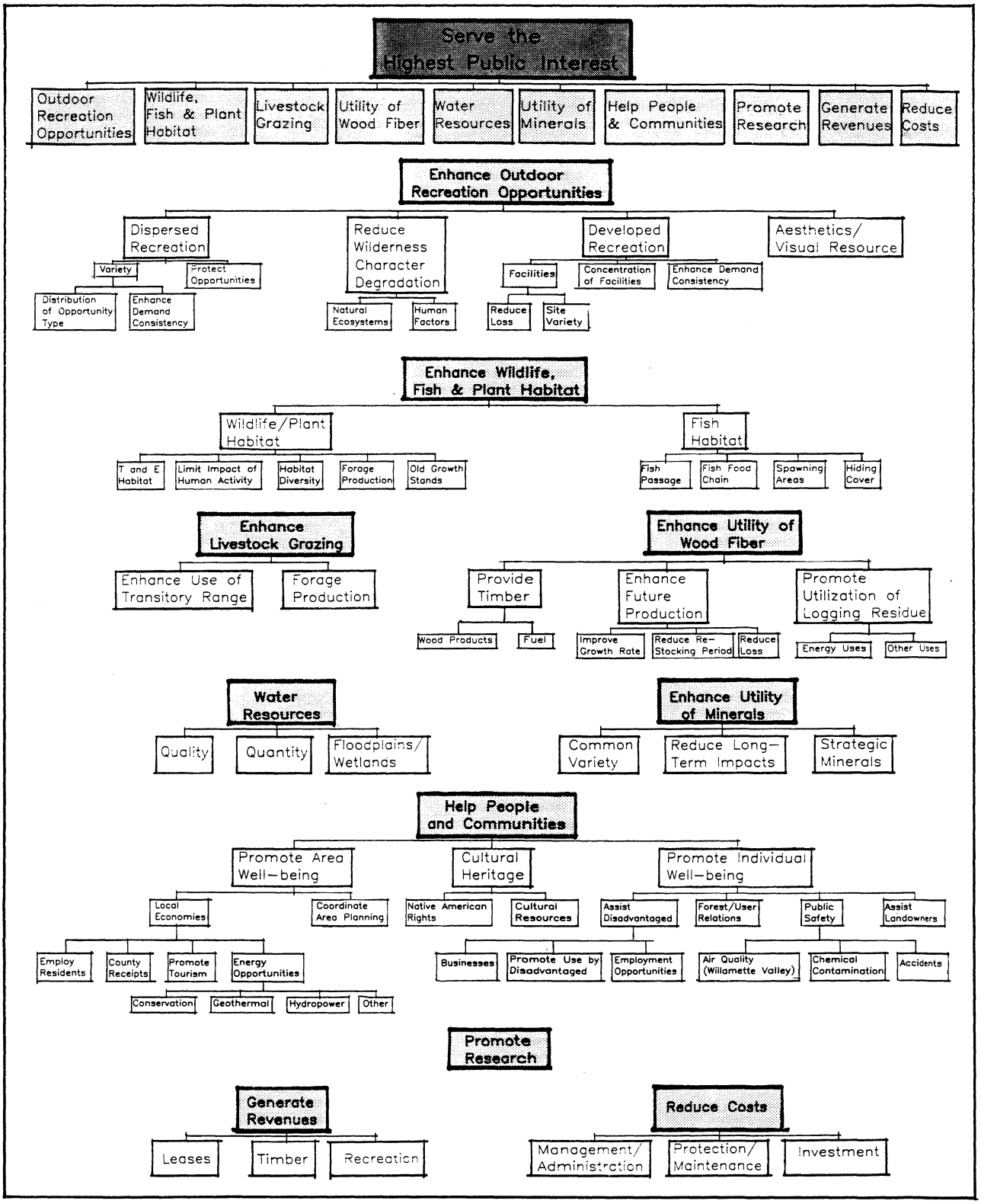
The first section is the description of the ICO identification process through publication of the DEIS. This section addresses: how issues were formulated; how their importance and weight were assessed; the criteria used to determine the capability of the Forest Plan to address the issues; the validation and revision of the objectives hierarchy; and a general description of the facets to the issues which could be addressed through allocation of resources available to the Forest.

The second section discusses the major issues and their disposition. It contains three subsections. The first subsection discusses in greater depth certain "key" or major issues which were of relatively greater importance in the selection of a preferred alternative. Those key issues are explored in terms of the relationships between resources both within and between the key issues, as well as in terms of the competing human interests served by varying management responses to those issues. The second subsection briefly discusses refinements to five of the key issues resulting from public and internal input during the interval between the DEIS and FEIS. The third subsection directs the reader to those chapters within the FEIS and LRMP where the issues are given intensive treatment. It also displays the principal indicators and the quantitative measures which can be used to judge responsiveness to the key issues and economics.

The third section describes outreach made to consult with other agencies, groups, and Indian tribes which was in addition to general public involvement activities. These contacts were made because these agencies, groups, and tribes were believed to have special interest or expertise in the forest planning process.

Appendix A bears a special relationship to Appendix I. Readers are encouraged to consult Appendix I for a more complete understanding of the range of the issues, concerns, and opportunities the public believes faces the management of this Forest.

Figure A-A-1


Serve the Highest Public Interest
Outdoor Recreation Opportunities
Wildlife, Fish & Plant Habitat
Livestock Grazing
Utility of Wood Fiber
Water Resources
Utility of Minerals
Help People & Communities
Promote Research
Generate Revenues
Reduce Costs
Enhance Outdoor Recreation Opportunities
Dispersed Recreation
Variety
Protect Opportunities
Distribution of Opportunity Type
Enhance Demand Consistency
Reduce Wilderness Character Degradation
Natural Ecosystems
Human Factors
Developed Recreation
Facilities
Concentration of Facilities
Enhance Demand Consistency
Reduce Loss
Site Variety
Aesthetics/ Visual Resource
Enhance Wildlife, Fish & Plant Habitat
Wildlife/Plant Habitat
T and E Habitat
Limit Impact of Human Activity
Habitat Diversity
Forage Production
Old Growth Stands
Fish Habitat
Fish Passage
Fish Food Chain
Spawning Areas
Hiding Cover
Enhance Livestock Grazing
Enhance Use of Transitory Range
Forage Production
Enhance Utility of Wood Fiber
Provide Timber
Wood Products
Fuel
Enhance Future Production
Improve Growth Rate
Reduce Re-Stocking Period
Reduce Loss
Promote Utilization of Logging Residue
Energy Uses
Other Uses
Water Resources
Quality
Quantity
Floodplains/ Wetlands
Enhance Utility of Minerals
Common Variety
Reduce Long-Term Impacts
Strategic Minerals
Help People and Communities
Promote Area Well-being
Local Economies
Employ Residents
County Receipts
Promote Tourism
Energy Opportunities
Conservation
Geothermal
Hydropower
Other
Coordinate Area Planning
Cultural Heritage
Native American Rights
Cultural Resources
Promote Individual Well-being
Assist Disadvantaged
Businesses
Promote Use by Disadvantaged
Employment Opportunities
Forest/User Relations
Air Quality (Willamette Valley)
Public Safety
Chemical Contamination
Accidents
Assist Landowners
Promote Research
Generate Revenues
Leases
Timber
Recreation
Reduce Costs
Management/ Administration
Protection/ Maintenance
Investment

Issues, Concerns, And Opportunities Identification Process

The process of issue identification through the publication of the DEIS began in the fall of 1979. The formal announcement of the intent to prepare an Environmental Impact Statement for a new Willamette National Forest Management Plan was published in the Federal Register and local newspapers.

An initial comprehensive draft of existing and anticipated issues, concerns, and opportunities was circulated on-Forest to Rangers, Staff, and Zone Engineers for review and comment. Several questions and topics were presented under the following subject areas: Protection (Fire, Insects, and Disease); Wilderness Management; Visual Resource; Chemical Use; Human and Community Development; Cultural Resources; Use Permits; Water; Land; Soils; Plant and Animal Diversity; Transportation; Recreation; Timber; Threatened and Endangered Animals; Range; Resident and Anadromous Fish; Riparian; Energy; Geothermal and Other Energy; Minerals, including Common Variety.

The issues, concerns, and opportunities were expressed as objectives, and a hierarchy was developed. Figure A-A-1 is a schematic representation of this hierarchy. At the top appears the broadest, most general objective of Land and Resource Management Planning. Each successive layer further defines the broad purpose. At the bottom the most specific statements of the objectives are expressed. Narrative definitions explaining each of the objectives were reviewed by Forest Service employees who were judged familiar with public opinion to assess the completeness of the objectives hierarchy. Another review by the Forest's Management Team followed.

Next a response packet to solicit public comments was prepared. The packet used the hierarchy as a framework and contained three items. The first was a newsletter explaining the planning process and describing the need for public participation. The second was a booklet discussing the anticipated issues for this round of planning. Facets to these issues were developed from specific statements in the objectives hierarchy and were included in the booklet. The third item was a response form for return to the Willamette National Forest Supervisor's Office. The packets were mailed to over 1,000 names and addresses on the Forest's planning contact list, and another 300 packets were distributed from the various Forest offices and during meetings with various organizations.

The specific issue subject areas listed in the public response packet were:

- *Dispersed Recreation:* To provide a range and a quantity of opportunities.
- *Developed Recreation:* To provide a range and a quantity of opportunities.
- *Wilderness:* To allow for the uninterrupted functioning of the area's natural processes.
- *Aesthetics:* To provide opportunities for a pleasant visual experience for all visitors to the Forest.
- *Wildlife/Plant Habitat:* To provide for plentiful and diverse habitats.
- *Fish Habitat:* To provide habitat for anadromous and other fisheries.
- *Livestock Grazing:* To provide for livestock forage production and the use of the Forest's transitory range.
- *Current Production:* To provide timber in the present decade for wood products.

- *Future Production:* To provide for supplies of timber continuing beyond the current decade.
- *Utilization of Slash:* To promote the use of slash for energy production and other uses.
- *Water Quality:* To provide high quality water for municipal watersheds, fish habitats, and other uses.
- *Water Quantity:* To provide sufficient quantities of water to meet demand.
- *Floodplains/Wetlands:* To provide for the natural functioning and to protect their productivity.
- *Minerals:* To provide for the extraction of common, precious, and strategic minerals.
- *Area Well-Being:* 1. Local Economies: To promote the economic health of local areas.
- *Area Well-Being:* 2. Energy: To facilitate the development of sources of potential domestic energy.
- *Cultural Heritage:* To protect the cultural, historic, and natural aspects of our national heritage. This includes protecting the rights of Native Americans.
- *Individual Well-Being:* To promote public safety and provide assistance to landowners and the disadvantaged.
- *Promote Research:* To promote research in various fields of study by identifying needs and cooperating with researchers.
- *Generate Revenues:* To generate receipts for the Federal general fund.
- *Management Efficiency:* To use cost-effective methods of providing Forest outputs.

Open house sessions were held to explain the issues packet and response forms, as well as opportunities to participate in the Forest's planning process. The open house sessions were informal, offering assistance in preparing response forms and answering questions. The Eugene Open House, November 24, 1980, was attended by 61 people. The Salem Open House, November 25, was attended by 22 people. The Albany Open House, November 25, was attended by 11 people.

Response forms were due back January 2, 1981. 291 forms were returned out of the 1,300 distributed. An additional 41 items of correspondence were submitted and were included in the analysis process.

Through the open house and response packet process, people were asked to rate the importance of the issues, suggest revisions, and give supporting reasons and comments. Figure A-A-2 shows how the public rated the importance of each of the 21 issues.

People were also asked to weigh or rate the relative importance of the issues after they were grouped into 10 resource categories, by allocating a total of 100 points across the 10 categories. Figure A-A-3 presents the results of this exercise.

No formal updating of the relative ratings and rankings of the issues represented in Figures A-A-2 and A-A-3 was conducted for the FEIS. A discussion of what the Forest considers the major refinements

of issues since the early 1980s can be found later in this Appendix in the subsection "Issue Refinement Between the DEIS and the FEIS."

Table T146. Issue Importance [1] (Figure A-A-2)

Issue No.	Issue Subject	Very Important	Fairly Important	Not Important
1.	Dispersed Recreation	44	44	8
2.	Developed Recreation	33	52	11
3.	Wilderness	55	30	12
4.	Aesthetics	33	49	15
5.	Wildlife/Plant Habitat	63	34	6
6.	Fish Habitat	56	37	3
7.	Livestock Grazing	6	28	61
8.	Current Production (Timber)	64	27	6
9.	Future Production (Timber)	84	13	1
10.	Slash Utilization	55	28	14
11.	Water Quality	82	14	1
12.	Water Quantity	42	34	21
13.	Floodplains/Wetlands	49	36	11
14.	Minerals	22	48	24
15.	Area Well-being; Local Economies	45	38	13
16.	Area Well-being; Energy	42	41	12
17.	Cultural Heritage	32	37	27
18.	Individual Well-being	24	47	24
19.	Promote Research	46	34	17
20.	Generate Revenues	40	39	17
21.	Management Efficiency	62	28	5

[1]Figures Indicate Percentage of Importance Respondents Assigned Each Issue on Response Form

Table T147. Issue Weights [1] (Figure A-A-3)

Issue Numbers on Response Form	Resource Category	Weight
1, 2, 3, 4	Outdoor Recreation	13
5, 6	Wildlife, Plants, Fish	14
7	Livestock Grazing	2
8, 9, 10	Timber	21
11, 12, 13	Water Resources	13
14	Minerals	4
15, 16, 17, 18	Human and Community Development	7
19	Promote Research	6
20	Generate Revenues	7
21	Management Efficiency	8

[1]Calculated by resource category.

Development of the final list of issues for Regional Forester review and approval involved analyzing the public responses received in early 1981. One step in this analysis involved assessing the capability of the Forest Plan to address each issue:

1. Was the issue or concern within the legal responsibility of the Willamette National Forest?

2. Did the issue or concern pertain to the responsibility of other Federal, State, or local governmental agencies?

3. Could the issue or concern be resolved by the National Forest Management Act (NFMA) planning process?

4. Could the issue or concern be best resolved at the National, Regional, or Forest level?

5. Did the issue or concern affect: (a) Forest land-use patterns, or (b) the nature, quality, or quantity of outputs from the Willamette National Forest?

6. Could the issue or concern be resolved more effectively through other already existing management processes, such as environmental assessments, policy statements, manual supplements, or project work plans?

The final phase of the analysis had as its central theme the goal of validation or revision of the objectives hierarchy from suggestions and comments contained in the response documents.

First, every comment about an issue was read and paraphrased onto lists under appropriate headings. After all responses were listed, each was compared to the descriptions of the most specific statements of objectives from the objectives hierarchy. If the specific statement of objectives adequately described a given response, a code was assigned to the paraphrased comment linking it to the appropriate position within the hierarchy. If no existing specific statement of objectives adequately described a given response, a new description was added to the appropriate section of the hierarchy and the paraphrased comment so coded.

A finalized list of 19 issues was sent to the Regional Office with the accompanying comments:

1. While the final regulations suggest that we do not consider additional areas for Wilderness designation, many of the public expressed their desires that this issue be addressed.

2 The issue of old-growth management is treated under the timber production issues and the wildlife/plant habitat issue.

3. The firewood issue is considered a part of four other issues.

4. The issue of the use of herbicides and chemicals in general is addressed in terms of growth rate, wildlife/plant habitat, water quality, and public safety.

5. Transportation system management is addressed as it relates to access timber, recreation and wilderness, mineral sources, and for the physically disadvantaged.

The result of Regional Office review was modification of the document to incorporate the issue named "Promote Research" as a component of other issues, instead of treating it separately. In October 1981 a document listing the following 18 issues (planning questions with their facets) was published:

1. CURRENT TIMBER PRODUCTION

What emphasis should the Willamette National Forest place on providing timber supplies during the present decade?

FACETS: Production of timber on the shortrun basis involves developing or applying technologies to: improve product utilization in the woods and at point of manufacture (or use as firewood), harvest of difficult or sensitive areas, accomplish reforestation of cutover lands, provide access, and intensify cultural treatments sensitive to environmental concerns.

2. FUTURE TIMBER PRODUCTION

What emphasis should the Willamette National Forest place on providing timber supplies beyond the present decade?

FACETS: The determination of the productive land base, the intensity of applying management practices, and the rate of old-growth harvest are the most important aspects of this issue. Improvements in growth rate (possibly using fertilizers); reducing the restocking period; and limiting losses due to fire, waste, disease, and pests (possibly using pesticides or other chemicals) are additional concerns.

3. LOGGING RESIDUE

What emphasis should the Willamette National Forest place on achieving the utilization of logging residues?

FACETS: Logging residue as an alternative energy source. Maintaining natural decomposition, wildlife habitat, and nutrient cycling are some of the considerations. Recognition of air quality standards, cost-effectiveness, and accessibility are other important concerns.

4. WILDLIFE AND PLANT HABITAT

What emphasis should the Willamette National Forest place on promoting habitat for wildlife and plant species?

FACETS: Habitat richness is the relative degree of ability of a habitat to produce numbers of species of either plants or animals; the more species produced, the richer the habitat (Thomas, J. W., Wildlife Habitats in Managed Forests, USDA Forest Service, Ag. Handbook No. 553, 1979). Management of wildlife and plant habitat requires special consideration for threatened, endangered, and sensitive species, wildlife forage production, old-growth habitat and the impact of human activities upon wildlife and plant communities. Opportunity costs of promoting habitat richness; intensity of Forest management practices (possibly using fertilizers, pesticides, or other chemicals); and coordination with the appropriate Federal, State, and local agencies are additional considerations.

5. AQUATIC HABITAT

What emphasis should the Willamette National Forest place on providing habitat for aquatic species?

FACETS: Providing habitat and quality fisheries requires consideration of fish migration routes, food chains, spawning areas, hiding cover, and water suitability. Opportunity costs of providing and maintaining aquatic habitats; intensity of Forest management practices; and coordination with the appropriate Federal, State, and local agencies are additional considerations.

6. DISPERSED RECREATION

What emphasis should the Willamette National Forest place on providing dispersed recreational opportunities?

FACETS: Providing a range and a variety of dispersed recreation opportunities outside wilderness involves considerations of how much and what types, location, conflicts, and compatibilities among users and uses, and proximity to population centers. In addition, the quality of opportunities to be provided is an important aspect of these considerations.

7. DEVELOPED RECREATION

What emphasis should the Willamette National Forest place on providing a range of developed recreation opportunities?

FACETS: Providing a range of developed recreation opportunities requires consideration of facility types, distribution throughout the Forest, proximity to population centers, and demand patterns. Facility design standards and maintenance levels are important quality considerations.

8. WILDERNESS

What emphasis should the Willamette National Forest place on managing existing wilderness areas?

FACETS: Management proposals for wilderness areas must address the relationships between natural processes and human activities. Resource degradation and the disruption of natural processes are functions of the amount of use, user distribution, and behavior.

9. SCENIC RESOURCE

What emphasis should the Willamette National Forest place on providing a variety of pleasant scenic experiences?

FACETS: While providing other benefits, management of the scenic resource involves considerations of actual treatment, design, and the amount and rate of management activities occurring in the landscape. In addition, important factors to be addressed include specific practices, techniques, and methods, as well as the extent of their applications.

10. WATER PRODUCTION

What quality and quantity of water should the Willamette National Forest produce?

FACETS: Water, as defined in terms of quality and quantity, is influenced not only by natural conditions but by the scope, timing, location, amount, or intensity of management actions. Of these actions the manner in which the riparian zones are treated is very important.

11. ECONOMIC EFFICIENCY

What is the tradeoff between efficient allocation of resources and the production of desired levels of outputs on the Willamette National Forest?

FACETS: The concept of economic efficiency implies a commitment to high quality investments based upon careful consideration of all benefits and costs, many of which are not readily quantifiable. An important aspect of operating in a cost-effective manner is reducing costs; one method may be through the use of increased contracting.

12. LOCAL ECONOMIES

What emphasis should the Willamette National Forest place on providing outputs and services in response to local needs?

FACETS: Maintaining land and resource management options may be more important than the production of a single output. Important considerations in determining the appropriate mix of programs for local economic stability include the amount and distribution of revenues produced by the Forest, the need for diversification of local economies, the relationship between Forest management practices and labor hiring policies, and the amount of preferential treatment given to small businesses.

13. ENERGY

What emphasis should the Willamette National Forest place on the development and conservation of energy sources?

FACETS: Potential sources of energy currently emphasized include hydropower, geothermal, and fuel wood. Additional concerns include conservation of energy in Forest activities and the provision of powerline corridors for energy transmission.

14. INDIVIDUAL WELL-BEING

What emphasis should the Willamette National Forest place on individual well-being?

FACETS: Individual well-being entails civil rights, including Native American rights, public safety (including the safe use of chemicals), employment opportunities, and assistance to landowners and the physically and economically disadvantaged. In addition, opportunities exist to improve access, particularly for the physically disadvantaged, and to make environmental education available to the public.

15. CULTURAL RESOURCES

What emphasis should the Willamette National Forest place on the cultural resources program?

FACETS: The cultural resources program involves the identification, interpretation, and protection of the cultural, historic, and natural aspects of our national heritage.

16. MINERALS

What emphasis should the Willamette National Forest place on the management of mineral resources?

FACETS: The primary aspects are the exploration and the removal of common variety, precious, and strategic minerals, particularly in the next decade. Land reclamation is particularly important for reducing long-term impacts on other resources.

17. AIR QUALITY

What emphasis should the Willamette National Forest place on maintenance of air quality?

FACETS: Air quality concerns include the production of smoke, dust, and other particulate matter and the need to keep particulates from intruding into Class I and Class II areas.

18. LIVESTOCK GRAZING

What emphasis should the Willamette National Forest place on providing for livestock forage production and the use of the Forest's transitory range?

FACETS: Dealing with livestock forage production and transitory range use involves considerations of enhancing use, forage production, and livestock management to avoid impacting other resource values.

MAJOR ISSUES AND DISPOSITION OF ISSUES

Major Issues

By the time of publication of the DEIS, modifications were made to the 1981 list of primary issues. These modifications were made to reflect refinements in public opinion during that interval and to reduce complexity within the planning documents. In some cases closely interrelated issues were grouped together. Examples include consolidating "Aquatic Habitat" into "Wildlife, Fish, and Plant Habitat;" and combining "Current and Future Timber Production" into one issue named "Timber Supply." Other topics, such as Old Growth and Roadless lands, had increased in public interest to such a large degree that they were then being treated as separate issues.

While all of the issues were considered during the development of the DEIS Alternatives, the degree of response to the major ones was of greatest importance in selecting the Preferred Alternative for the Draft Forest Plan. Issues were considered of "major importance" if they were the subject of continually recurring correspondence, individual visits, or meetings involving other public agencies, organized groups and industry, or the public at large. These issues were also often discussed in media reports. The major issues that provided the focus for the DEIS were Dispersed Recreation; Old Growth; Roadless Lands; Scenic Quality; Timber Supply; Water; and Wildlife, Fish, and Plant Habitat.

A brief discussion follows about each of the seven major, or "key" issues which were the subject of special focus in the DEIS. These key issues, with some refinements discussed later in this Appendix, remain the major issues considered in the FEIS and Final Forest Plan. In addition, readers are encouraged

to read Chapters I and III of the FEIS for a more complete discussion of the interrelationships and conflicts among resources.

Dispersed Recreation

Demand for recreation opportunities on the Forest remains high. People are interested in maintaining a wide variety of options for recreation activities. The subject of roaded and unroaded dispersed recreation opportunities carry the greatest potential to vary among Alternatives. There is concern about how the management decisions made in the Forest Plan will increase or decrease these opportunities.

There is continuing, although somewhat less intense, interest in managing for developed recreation, as well. Developed sites are tracked through the process; but they are not treated as a major issues, because there is less land involved and less intensity of public interest. Decisions made regarding developed recreation have a low significance in affecting the overall management of other Forest resources.

Old growth

In the early stages of development of this Forest Plan, the management of old-growth stands was considered part of the timber production and fish and wildlife habitat issues. By the publication of the DEIS, however, increasing public attention had warranted treating it as a separate category despite its particularly strong interrelationships with other issues.

Part of the public sees a need to preserve old growth for its benefits to plant and wildlife habitat diversity, soil and water productivity, and its recreational and aesthetic values. Another segment of the public recommends converting the old growth stands to more vigorously growing second growth stands to support future timber production needs. The amount of the old growth to be harvested in the next decade affects the current timber supply also.

Roadless Lands

Although the Oregon Wilderness Act of 1984 resolved part of the issue concerning Wilderness, interest in some of the Willamette's roadless lands has remained high. "Wilderness" as an issue was rated highly important by the 1981 respondents. In 1983 a reinventory of the roadless lands on the Forest included extensive public involvement, including a 1200-piece mailing and a series of public meetings. The 1984 Act increased the amount of designated Wilderness on the Forest to about 25% of the land base.

The nature of this issue revolves around using these lands for timber production; or to defer harvest to preserve old growth trees, provide habitat diversity, and protect aesthetic values. A "no-harvest" allocation assigned to unroaded areas would also tend to maintain options for future designation as Wilderness. Some people feel that the marketable resources in these areas should be developed; some feel that they should remain undeveloped. Still others feel that some lands currently in a developed condition should be returned to an undeveloped condition, particularly if the lands are adjacent to designated Wilderness.

Scenic Quality

The visual quality of the Forest landscape is of concern to adjacent landowners, travelers, and Forest visitors. Many people prefer not to see evidence of timber harvesting from major highways and popular recreation areas such as trails, campgrounds, and scenic overlooks. Other people, who tend to favor utilization of Forest resources, feel that most visual effects of resource management activities are temporary, so that Visual Quality Objectives should play a reduced role in planning such activities.

Timber Supply (Current and Future Timber Production)

The Forest annually provides the largest amount of timber production in the National Forest System. The amount of timber produced on the Forest therefore assumes some level of national as well as local importance. In addition, since the wood products industry is one of the three major components of the economy of the State of Oregon, concern has also been high for several years about the level of contribution the Forest's timber resource makes to the overall timber supply within the State, as well. In the 1981 survey current and future timber production received the highest weighted importance. Interest has not decreased since then.

Some people feel that the allowable harvest is too high, resulting in unacceptable adverse effects to other resource values. Others believe that the level of harvest should be maintained or increased to provide the raw material to help satisfy needs for wood products and to provide a stablizing force on the economies of local communities which may be highly dependent upon the various wood products industries.

Additional components of the timber supply issue include: logging residues and firewood, harvest schedules and methods, use of herbicides and fertilizer, reforestation, and species mix, and access.

Water Quality and Quantity

Water quality received the second highest rating for issue importance in the 1981 issue development survey. The natural level of water quality on the Forest is generally quite high. Consequently, unlike many of the other issues addressed by the Forest Plan, the concern centers more on minimizing degradation than taking specific actions to enhance the resource over natural levels. Accordingly, much of the treatment given this issue can be found in the Standards and Guidelines and Monitoring sections of the documents.

Water quantity was of less concern than quality, and only slight variations between Alternatives exist. Adequate and consistent water supply for streamflow for fish habitat and domestic uses were of greatest concern.

Wildlife, Fish, and Plant Habitat

The broad issue of habitat represents a complex of concerns about the living components of the Forest. Central to the issue are matters of species survival and maintaining ecological diversity.

Concerns range from continuation of game species for hunting and fishing to preservation of reptiles and insects to threatened, endangered, and sensitive plant species. Differences of opinion arise about the extent and nature of land allocations and mitigation requirements associated with various individual, commercial, and management activities which are needed to assure adequate support for the viability and distribution of the various native species.

Issue Refinement Between The DEIS And The FEIS

The key issues did not change between the DEIS and the FEIS, but some refinements in focus occurred, most notably to five of the key issues. The attempt to be responsive to these refinements ultimately led to analysis of three new alternatives in the FEIS. The five affected key issues are identified with the same descriptors used in the preceeding discussion of major issues.

Dispersed Recreation

A segment of the McKenzie River and the North Fork of the Middle Fork of the Willamette River received Wild and Scenic River designation by Congress in 1988. Congress also required that Blue River and the South Fork of the McKenzie River be studied for their suitability for Wild and Scenic River status. The State of Oregon added two additional rivers to its State Scenic Waterways inventory. Interest in studying additional rivers and their segments for similar designations has intensified.

Special designations of these types affect management practices on the rivers and surrounding lands. Timber harvest, road building, and recreation site development may be constrained or eliminated for some distance from the rivers themselves. Retaining the special values of study rivers pending suitability determination similarly affects the nature and extent of new management activities in those areas until suitability is resolved.

Old Growth

The intensification of public interest surrounding old growth has involved a number of key issues: old growth as forest structure; old growth as a reservoir of timber supply; old growth as an ecosystem providing a unique habitat in support of other plant and animal species. This discussion focuses on old growth as forest structure. Related discussions can be found in the Timber Supply and Wildlife, Fish, and Plant Habitat subsections.

One of the more perplexing aspects to addressing old growth concerns was the apparent lack of unanimity of definition. Some of the more commonly used definitions are the Region 6 definition (Regional Guide), the Pacific Northwest Range and Experiment Station definition (PNW 447), and the definitions proposed by the Wilderness Society and the Society of American Foresters. In order to enhance public understanding of old growth issues, data are analyzed and displayed in the FEIS using several different definitions.

Increased attention has focused on the silvicultural values of old growth structure, including its capability to retain and enhance soil and water productivity. This attention has not limited its scope to preservation of existing stands. Indeed, interest in old growth structure has been instrumental in the development of changing philosophies of site utilization and stand regeneration techniques, known as "the New Forestry" and "New Perspectives Forestry."

Differences in public and professional opinion exist about the extent to which increased preservation of old growth and "New Perspectives" forestry should occur; the specific nature of indicated practices; the best locations in which to undertake the practices; and the attendant risks involved, such as susceptibility to fire and disease.

Timber Supply

The Timber Supply issue intensified to near-crisis proportions during the period between the DEIS and the FEIS. Although the values of harvested timber on the Forest reached all-time highs, the volume sold for eventual harvest dramatically reduced by fiscal year 1989. Much of the reduction in sold volume was in response to court injunctions associated with spotted owl habitat litigation. The current and intermediate term availability of timber from all sources within the State of Oregon achieved high levels of public concern. Central to this concern was the contribution made by the federal sector, particularly in the form of old growth timber.

Ultimately Congress balanced the habitat needs of the spotted owl with the federal supply needs of old growth dependent mills by passing the Northwest Timber Compromise as Section 318 of the Fiscal

Year 1990 Appropriations Act. This legislation was acknowledged not to represent a permanent solution, however. Consequently, the public issues remain for evaluation under the planning process.

In addition, many public comments alerted the Forest to improvements which could be made to the technical analysis of timber availability.

Water Quality and Quantity

Public comments during the response period after publication of the DEIS sent the strong message that many of the alternatives in the DEIS, including the preferred alternative, proposed unacceptable levels of watershed degradation. This did not so much represent a refinement of public concern as it represented a reaffirmation of the intensity with which the concern was held and the need for the Forest to address the issue with greater sensitivity.

Wildlife, Fish, and Plant Habitat

During the interval between the DEIS and FEIS, concerns surrounding plant and animal diversity and habitat preservation intensified. These concerns spanned a wide variety of species, habitats, and management practices. The most notable representatives of these concerns were spotted owl habitat, old growth as a reservoir of a unique and valuable ecosystem, and riparian areas as critical ecosystems.

These issues were central to examining notions such as habitat connectivity and preserving options. In many cases, however, decisions to provide or enhance such connectivity or to preserve options produce reductions in timber supply or suggest relatively more costly harvest techniques.

Disposition Of The Issues

The initial planning concerns, as well as the seven key issues, are discussed in several places throughout the FEIS and in the Final Forest Plan. Figure A-B-1 indicates the chapters in the documents which address the issues. The Alternatives displayed in the FEIS differ primarily in the way they respond to the planning issues. Figure A-B-2 lists the "indicators of responsiveness" which are used to show a quantified level of response. Figure II-E-29 displays the Alternatives' outputs and effects, listed by the key issues.

Table T148. Disposition of Forest Issues (Figure A-B-1)

Planning Concern (Appendix A)	Plan Issue (Chapter 1) (FEIS)	Altenatives (Chapter 2) (FEIS)	Consequences (Chapter 4) (FEIS)	Standards and Guidelines (Forest Plan)
Dispersed Recreation	Yes	Vary by Acres & Management	Yes	Yes
Developed Recreation	No	Vary by Sites	Yes	Yes
Wilderness (combined) [1]	No	One Area Variable	Yes	Yes
Visual/Scenic	Yes	Vary by Acres VQO	Yes	Yes
Cultural Resources	No	Inventory Acres & Type	Yes	Yes
Wildlife and Plant Habitat	Yes	Vary by Acres & Type	Yes	Yes
Aquatic Habitat (combined) [1]	No	Vary by Acres	Yes	Yes
Livestock Grazing (Range)	No	Vary by AUMs	Yes	Yes
Timber	Yes	Vary by Acres & 1st Decade ASQ	Yes	Yes
Logging Residues (combined) [1]	No	Firewood: Vary by MCords	Yes	Yes
Water Quality; Water Quantity	Yes	Vary by Risk Level; Acre/Feet	Yes	Yes
Air Quality (combined) [1]	No	--	Yes	Yes
Minerals	No	Entry Acres Available	Yes	Yes
Energy	No	Entry Acres Available	Yes	Yes
Individual Well-being	No	--	Yes	No
Local Economics	No	Jobs; Income; Revenue	Yes	No
Old-Growth	Yes	Vary by Acres	Yes	Yes
Roadless Lands	Yes	Vary by Acre & Areas	Yes	No
Economic Efficiency	No	Present Net Value	Yes	No

[1]The facets of this issue have been incorporated into another related issue and information on the topic may be tracked throughout the FEIS (see Index).

Table T149. Indicators of Responsiveness (Figure A-B-2)

ISSUE/Indicator	Unit of Measure
DISPERSED RECREATION	
Lands Allocated to Semiprimitive - Nonmotorized	Thousand Acres
Lands Allocated to Semiprimitive - Motorized	Thousand Acres
Lands Allocated to Special Interest Areas	Thousand Acres
Lands Allocated to Old-Growth Groves	Thousand Acres
Trail Construction in the 1st Decade	Miles
OLD-GROWTH	
Amount of Old-Growth Timber Retained	Thousand Acres
ROADLESS LANDS	
Roadless Acres Left Undeveloped	Thousand Acres
SCENIC QUALITY	
Lands Allocated to a Retention VQO	Thousand Acres
Lands Allocated to a Partial Retention VQO	Thousand Acres
Lands Allocated to a Modification VQO	Thousand Acres
TIMBER SUPPLY	
Allowable Sale Quantity in the 1st Decade	Million Board Feet
Allowable Sale Quantity in the 1st Decade	Million Cubic Feet
Long-Term Sustained Yield	Million Cubic Feet
WATER (Quality and Stream Condition)	
Area with Risk of Adverse Impact Rating (Low, Medium, & High)[1]	Percent in each Rating

ISSUE/Indicator	Unit of Measure
WILDLIFE, FISH, AND PLANT HABITAT	
Habitat Capability for Spotted Owls (Mature/old-growth habitat)	Acres of Habitat Maintained
Habitat Capability for Pileated Woodpecker (Mature/old-growth habitat)	Acres of Habitat Maintained
Habitat Capability for Pine Marten (Mature/old-growth habitat)	Acres of Habitat Maintained
Habitat Capability for Elk (End of 1st Decade)	Ratio Between Percent of High, Medium, Low Emphasis
Habitat Capability for Deer (End of 1st Decade)	Ratio between Percent of High, Medium, Low Emphasis
Special and Unique Habitats	Acres Protected
Bald Eagle Recovery	Number of BEMAs; Acres of Nesting Habitat
Peregrine Falcon Recovery	Number of Potential Nesting Cliffs
Cavity Nesting Habitat	Percent Potential Population Managing for
ECONOMICS	
Changes in Numbers of Jobs in 1st Decade	Number of Jobs
Changes in Income in the 1st Decade	Millions of Dollars
Payments to Counties in the 1st Decade	Millions of Dollars
Net Cash Flows in the 1st Decade	Millions of Dollars
Present Net Value for 15 Decades	Billions of Dollars

[1]See Chapter IV, Water, for further explanation.

CONSULTATION WITH OTHERS

The size and scope of the Willamette National Forest and its location near large municipal centers in the Willamette Valley led to a high level of continuous public contact. Although the discussion below makes no attempt to be exhaustive, it describes many of the organizational contacts which were made in the development of the FEIS and Final Forest Plan. Readers specifically interested in the public comments after publication of the DEIS should read Appendix I.

Agencies And Groups

The Forest worked closely with a number of governmental entities holding special expertise in many diverse disciplines touching forest management. For instance, neighboring National Forests were consulted, particularly on matters of mutual concern where a measure of relative consistency in management treatment of forest resources were desirable. The Environmental Protection Agency, Bureau of Land Management, and the U.S. Fish and Wildlife Service are examples of other federal agencies which were consulted.

Counterpart agencies for the State of Oregon were also consulted, in particular the Oregon Department of Fish and Wildlife, the Oregon State Department of Forestry, the Oregon Department of Environmental Quality, and the Governor's National Forest Planning Team. Consideration was given to the "Forestry Program for Oregon" during alternative development.

Planning documents of various federal and State agencies were available in order to coordinate management where appropriate. County plans for Lane, Linn, Douglas, and Marion counties were reviewed.

Numerous consultations with elected officials of federal, State, and local jurisdictions, or their staff, yielded valuable information about the concerns of their constituencies and provided insight into the major issues surrounding the future management of this Forest. In many instances these consultations included tours and field trips, allowing discussions to be specific.

A series of meetings were held in January and February 1985 to provide an opportunity for participation in the development of resource management options for Alternative formulation. Many of the same individuals and groups that responded during the initial issue development process stayed with the process the entire time. In addition to formally scheduled public involvement activities, the Willamette encouraged continual involvement from groups expressing special interest in the management of Forest resources.

The Oregon Natural Resources Council (formerly Oregon Wilderness Coalition) and its member groups which use the Forest have been active in the Plan's development since 1980, submitting narrative and mapped proposals for land allocations. Some other especially active groups tending to emphasize noncommodity uses of the Forest include the Chemeketans, Old Cascades Wilderness Committee, Waldo Wilderness Council, Cathedral Forest Action Group, Hardesty-Mt. June Council, and Cascade Holistic Economic Consultants. The Mt. Jefferson Snowmobile Club, Oregon Trout, American Alpine Club, Obsidians, Sierra Club, and others have also been involved. Site specific concerns were recorded on a data base map and evaluated during Alternative formulation.

The Forest has also worked with "consensus groups" composed of members of the public and agency representatives to develop management proposals to be analyzed during this round of planning for

several locations on the Forest: Fall Creek, Hardesty Mountain, South Fork of the McKenzie, and Three Creeks.

In the interval between the DEIS and FEIS, the Forest also received valuable advice from a group known as the "Fruitful Discussions Group." This group was comprised of a number of representatives from the environmental community, timber industry, and local government who regularly met to provide advice to the Forest Supervisor in the development of the Forest Plan. While the members of the group recognized that their individual organizational goals frequently differed considerably, the Fruitful Discussions Group worked hard to develop a common understanding of specific issues affecting forest planning and to produce consensus recommendations on those matters where agreement could be reached. Given the range of informed opinion this group represented, the Forest found the group's recommendations very useful in clarifying the issues and narrowing the scope of topics of key concern.

Adjacent landowners and land managers were also included in public involvement activities. Summer homeowners also commented. The Breitenbush Community, Shiny Rock Mining Corporation, and the Willamette Pass Ski Area Corporation contributed input.

The primary industry which was represented during the planning effort was the timber industry, since raw material for wood products is the main commercial commodity available from the Forest. The Associated Oregon Loggers, Industrial Forestry Association, Northwest Timber Association, Western Timber Association, Willamette Timbermen, Oregon Women for Timber, and others have been continually involved. Individual mills and companies have also been represented.

Indian Tribes

There are four Indian Reservations in the vicinity of the Forest. They include the Confederated Tribes of the Warm Springs Reservation, the Cow Creek Band of Umpqua Indians, the Confederated Tribes of Siletz Indians, and tribes of Confederated Grand Ronde Indians. Letters were sent to the tribal council of each respective tribe to inform them that the Forest was preparing a new land management plan. The Forest encouraged participation in the planning process. A letter of this nature was also sent to the Bureau of Indian Affairs, Portland, Oregon.

Through the Willamette Cultural Resource Management Program, the Forest solicited input from the nearby tribes and the Bureau of Indian Affairs. Requested were their issues and concerns related to the Forest, areas on the Forest where the Indian tribes have had historic use, and the magnitude of that use. Historic use can include hunting, fishing, gathering, religious practices, or any other culturally sensitive activity.

An early consultation with Indian tribes in the Pacific Northwest was a series of coordinated meetings held by the Regional Forester in Seattle on November 10, 1981, and other selected locations and dates throughout the Region. Indian concerns generated at these meetings were forwarded to the Forest and incorporated into the planning process. Issues resulting from this interaction included: knowledge of and responsiveness to Native American treaty rights on Forest Service administered lands; responsiveness to cultural resource management laws and regulations including the American Indian Religious Freedoms Act; access to Forest resources for traditional uses and activities, including hunting, fishing, grazing, and gathering; the compatability of maintaining traditional Indian culture and religion with Forest Management programs; and building an atmosphere of trust between Native American leaders, their representatives (including attorneys, planners, and biologists), and Federal agencies.

The Forest, along with other Columbia Basin Forests in the Region contributed to a joint response to the Columbia River Intertribal Fisheries Commission, which requested data on anadromous fish production and habitat. The Columbia River Intertribal Fisheries Commission consists of representatives from the Yakima Indian Nation, Warm Springs Confederated Tribes, Nez Perce Indian Nation, and the Umatilla Confederated Tribes. The Willamette River, which drains the Forest, is confluent with the Columbia River below the Bonneville Dam; fisheries production from the Forest was not as large a concern to the Columbia River Intertribal Fisheries Commission as upper Columbia River fisheries issues.

Representatives from the Forest attended a conference in May 1986 entitled "Perspectives on the American Indian Cultural Heritage: Indians, Historians, and Archaeologists." The conference discussed important issues and concerns from Native Americans about the Cultural Resource Management Program. Issues included the working relationship between archaeologists and the Native American community, the importance of Native American historical and archaeological knowledge to Native Americans, the process the USDA Forest Service implements in the cultural site testing program, the treatment of burial sites, sacred sites and remains, religious sites, and respect and regard for American Indian values and interests.

No Indian burial sites have been found on the Forest. The Forest has worked with the Confederated Tribes of the Grand Ronde Indians to obtain input and involvement in the site testing program to determine the extent and nature of their use of lands on the Forest. In addition, Native Americans at the Native American Student Union on the University of Oregon campus and individuals in the community expressed a desire to establish a sweat lodge for religious practices on the Forest.

Native American Cultural Awareness Days in June 1986 and August 1987 provided a forum for the Confederated Tribes of Siletz Indians, the Native American Special Emphasis Program Coordinator on the Willamette National Forest, and Native American employees on the Forest to present Native American issues, culture, and art.

Informal meetings have occurred at various levels with Native American Tribes and the Forest Service. Site specific issues and concerns have been discussed at the Forest and Ranger District level with Warm Springs Confederated Tribe representatives. A portion of the Mt. Jefferson Wilderness on the Detroit Ranger District borders the Warm Springs Indian Reservation. Annually, Forest Service Wilderness guards and Tribal law enforcement officers meet informally. Trespass onto the Reservation by Forest hikers and commercial operators has surfaced as a concern. Coordination and pursuit of a cooperative management effort in the area is continuing.

Comments Recevied

The following is a nonexhaustive list of groups with whom the Forest met or from whom the Forest received written comments during the planning process:

Federal

Northwest Power Planning Council
U.S. Army Corps of Engineers
U.S. Congress - Representative Peter Defazio
U.S. Congress - Representative Denny Smith
U.S. Department of Energy - Bonneville Power Administration
U.S. Department of Interior - Bureau of Land Management

U.S. Department of Interior - Fish and Wildlife Service
U.S. Environmental Protection Agency
U.S. Senate - Senator Bob Packwood
U.S. Senate - Senator Mark Hatfield

State of Oregon

Department of Energy
Department of Geology and Mineral Industry
Department of Fish and Wildlife
Department of Forestry
Department of Transportation
Land Conservation and Development Commission
Office of the Governor
State Economist

County

Lane County
Linn County
Marion County

City

Detroit
Eugene
Gates
Mill City
Oakridge and Westfir
Salem
Springfield

Companies and Organizations

American Alpine Club
Associated Oregon Loggers
Atlantic Richfield
Bohemia, Inc.
Breitenbush Community
Cascade Holistic Economic Consultants
Cathedral Forest Action Group
Central Electric Cooperative
Chemeketans
Eugene Chamber of Commerce
Eugene Water and Electric Board
Friends of the Earth
Fruitful Discussions Group
Hardesty Mountain Consensus Group
Hardesty - June
Industrial Forestry Association
McKenzie Flyfishers
McKenzie Guardians
McKenzie Wild and Scenic River
Middle Santiam Wilderness Committee
National Wildlife Federation
Native Plant Society of Oregon

North Cascades Conservation Council
Northwest Off-Road Bicycle Association
Northwest Outward Bound School
Northwest Pine Association
Northwest Timber Association
Obsidians
Old Cascades Wilderness Committee
Oregon Equestrians
Oregon Natural Resources Council
Oregon Trout
Oregon Wildlife Federation
Oregon Women for Timber
Oregonians for the Protection of Ecological Quality
Save the North Fork Group
Shiny Rock Mining Company
Sierra Club, Northwest Office
Sierra Club, Many Rivers Group
Sierra Club, Portland, Bend, Seattle, Spokane, and Idaho
South Fork McKenzie River Corridor Task Group
The Wilderness Society
Towne Club
Umpqua Wilderness Defenders
Waldo Wilderness Council
Washington Wildlife Coalition
Western Industrial Foresters Association
Western Timber Association
Willamette Industries
Willamette National Forest Summer Home Owners
Willamette Timbermen

APPENDIX B

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APPENDIX B

DESCRIPTION OF THE ANALYSIS PROCESS

INTRODUCTION

Planning Situation

One of the primary responsibilities and challenges facing the Forest Service is deciding how best to manage National Forest lands to produce the goods and service desired by the public. Because National Forest lands and the resources they contain are valued by society, commitments to various uses represent significant decisions with far-reaching implications for current and future users.

The NFMA of 1976 (NFMA) directs each National Forest to prepare a comprehensive land management plan. The Forest's major planning goal under NFMA is to provide decision makers with sufficient information to determine the mix of goods, services and land allocations which best resolves the identified public issues in a manner that maximizes net public benefits. Net public benefits are defined as the overall long-term value to the Nation of all outputs and positive effects (benefits), less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not.

The regulations (36 CFR 219) developed under NFMA provide the analytical framework for developing a forest plan. The National Forest Management Act and its regulations also state that the requirements of the National Environmental Policy Act (NEPA) and its regulations (40 CFR 1500-1508) must be applied in this analysis process. The NEPA regulations require that the environmental effects of a proposed action and alternatives to that proposed action must be disclosed in an Environmental Impact Statement (EIS).

The planning problem is a very complex one. This complexity stems from the need to address a variety of interrelated and often conflicting issues by allocating land and scheduling activities in a cost-efficient manner for the entire Forest over a long period of time. The analytical processes and techniques used by the Forest to accomplish this are described in this Appendix.

Changes Between Draft and Final

Based on public comment the estimated effects (Step #6 below), the evaluation of alternatives (Step #7), the preferred alternative recommendation (Step #8) and even some of the formulation of alternatives (Step #5) have been revised for the FEIS. In this Appendix you will find many areas where the analysis process has changed. As you review the analysis process you will find new descriptions under the following topics.

Inventory & Data

- Timber inventory condition classes (updated for harvest)
- Timber age class stratification (young stands and large sawlogs/old growth disaggregated)
- Fertilizer response (increased)
- Spotted Owl inventory data (updated)
- Other mature conifer habitat allocations (modified)
- Soil resource inventory interpretation (corrected)
- Wild & Scenic Rivers (included)

Modeling Assumptions

- Analysis area stratification (revised)
- Allocation zones (moved to analysis areas)
- Limited entry areas (visuals, dispersed recreation, and some riparian) modeled outside FORPLAN
- Technical FORPLAN design (changed)
- IMPLAN model (updated)
- Wildlife, recreation and water quality models (changed)
- Breakage, defect and dead tree habitat factors (revised)
- Relational data base operations (added)

Management Changes

- Allowable sale quantity (salvable dead timber included)
- Alternatives considered in detail (changed)
- Timber prescription set (changed)

The Planning Process

The planning process described in the NFMA regulations consists of ten steps oriented towards a systematic analysis of the complex problems associated with multiple-use forest management. This 10-step process is discussed in Chapter I of the DEIS and is briefly summarized as follows:

1. Identification of purpose and need: Issues, Concerns, and Opportunities (ICO's) - In any systematic approach to problem solving, the first step is to identify the problem. In this step, the interdisciplinary Team (IDT) identifies and evaluates public issues, management concerns, and resource use and development opportunities. What does the public want? What does the Forest Service want? What needs to be done?

2. Planning Criteria - Criteria are designed to guide the collection and use of inventory data and information, the analysis of the management situation and the design, formulation, and evaluation of alternatives. This step sets the guidelines for accomplishing the next 5 steps.

3. Inventory data and information collection - The type of data and information needed is determined in step 2 based on the ICO's. The data is then collected and assembled in a manner meaningful for answering planning problems.

4. Analysis of the management situation - This step is a determination of the ability of the planning area to supply goods and services in response to society's demands. This provides a basis for formulating a broad range of reasonable alternatives.

5. Formulation of alternatives - A broad range of reasonable alternatives is formulated according to NEPA procedures. Alternatives are formulated in a manner which provide an adequate basis for identifying the one that comes nearest to maximizing net public benefits.

6. Estimated effects of alternatives - The physical, biological, economic and social effects of implementing each alternative considered in detail are estimated and compared according to NEPA procedures.

7. Evaluation of alternatives - Significant physical, biological, economic and social effects of implementing alternatives are evaluated with respect to the planning criteria.

8. Preferred alternative recommendation - The Forest Supervisor reviews the IDT's evaluation and recommends a preferred alternative to the Regional Forester who then selects one from the group that is provided. This is identified in the Draft Environmental Impact Statement and displayed as the proposed plan.

9. Plan approval and implementation - The Regional Forester reviews the proposed plan and Final Environmental Impact Statement and either approves or disapproves the plan.

10. Monitoring and evaluation - The plan establishes a system of monitoring at established intervals to determine how well objectives have been met and how closely management standards and guidelines have been followed. Based on these evaluations, the plan will be revised or amended as necessary.

Three distinct phases occur during this process. Planning steps 1, 2, 7, and 8 make up the judgmental or selection phase of the process. These steps are addressed in Chapters I, II, IV and in Appendix A of the DEIS. Steps 9 and 10 are execution steps and are dealt with in or through the proposed Forest Plan. Steps 3, 4, 5 and 6 are analytical steps and are addressed along with other details of the analysis in this Appendix.

INVENTORY DATA AND INFORMATION COLLECTION

Overview

The inventory step in the planning process consists of the collection, development, automation and documentation of data and information needed to address the ICOs and planning criteria identified in Planning Steps 1 and 2. Two basic types of information are needed to facilitate the analysis and development of alternatives. The first consists of information related to the classification of land into categories with unique properties. This classification can be based on land form, existing resources, production capabilities, political or other geographic boundaries, or some other attribute or combination of attributes. This type of information is directly tied to a map base, and to facilitate analysis of the size and complexity of forest planning, is usually handled by a computerized mapping system.

The second type of information is not tied directly to a map but has to do more with how the land responds to various activities applied to it. On a specific piece of ground, management activities and their associated costs result in the production of physical outputs and effects (i.e. yields) and some associated economic benefits and costs. To evaluate the planning problem, physical and economic yields and relationships are developed based on a potential set of management activities or prescriptions which can be applied to land with similar characteristics. This data comes from a variety of sources,

most of which are listed in the last part of this section. The rest of this section will discuss the mapping Data Base and some of the major uses of the vast amount of information assembled for the Land Management Planning process.

Data Base Development

The Forest considered use of several different automated data bases for storage and retrieval of geographic planning information. A grid mapping system, the Mt. Hood National Forest's version of R2MAP, was set up on the University of Oregon's computer and eventually transferred to the Forest's Data General computer system.

After selecting a mapping system, determining an appropriate grid cell size and map scale was necessary to initiate Data Base construction. A one inch to the mile scale was considered appropriate for Forest-wide planning because of the large size of the Forest and much information was already developed at that scale. The size of a grid cell is a function of the size of the two line printer characters used to represent the resource data mapped for that cell. A rectangular cell 1/5-inch by 1/6-inch accommodates two line printer characters. This represents 21.33 acres of land at the one inch to a mile scale.

A grid mapping system organizes the resource data into "layers" of information. This information can be overlaid in different orders and combinations to see the coincidence, correlations, and associations of the various resources for specific locations. The overlay technique provides a unique opportunity for analyzing data. It allows many types of information to be examined simultaneously and in different combinations. It also allows information to be manipulated quickly and accurately. The system accurately tallies acreages and locates those acres spatially.

Some types of information, however, can not be represented well in this mapping system. The 21.33 acre grid cell size makes linear (roads and streams) and small area information (administrative sites) hard to represent. Any spatial representation of these types of information distorts the acreage and a decision has to be made whether acreage or location is the most critical factor. For display maps the location is generally taken as the most critical factor but for analysis maps correct acreage summaries control the decisions.

Using the mapping system for planning influences the form in which data is needed. It also influences the level of resolution, detail and accuracy of the data actually used in planning. Some types of data lend themselves to this format better than others. But the limitations implicit in this are outweighed by the benefit of having all the information in a consistent, easily-used format so that all of it can be considered throughout the analysis and planning process.

The selection of layers to include in the mapping system was based on several factors. The major need for forest planning was the ability to combine basic resource data and geographic locations into analysis areas, and relate those acreages to potential land allocations. Other layers were included to assist in the calculation of costs, yields, effects, conditions, constraint values or acreage adjustments. Table B-1 lists the data layers in the mapping system. The last part of this section summarizes the major data sources for layers in the Forest's Data Base and other types of information used in Forest planning. Additional information on the Forest's Data Base is contained in the paper "Data Base Documentation" which is available in the Forest's planning records.

Toward the end of 1989 the Forest put the "MOSS" Geographic Information System (GIS) on its Data General computer system. Information on the management strategies and "Mature/OverMature Status" inventory were combined in the MOSS system to analyze old growth protection in the FEIS.

Table B-1. Mapping System Data Layers

SOILS	**ENGINEERING**
Soils	Transportation
Unsuited Soils	Rock Sources
	Minerals
WATER	**BOUNDARIES/LAND MANAGEMENT/ENCUMBRANCES**
Watersheds	Ownership
Riparian	Administrative Boundaries
	Wilderness
TIMBER	Research Natural Areas (RNA)
Timber Size	Roadless Areas
Timber Type	O&C Lands/Stipulated Mining Claims
Timber Update	Land Management Plan (LMP)
Commercial Thinning	Special Uses/Administrative Sites
Aerial Logging	Special Interest Areas/National Natural Landmarks/Wild and Scenic Rivers
WILDLIFE	Geothermal
Spotted Owl (SOMA)	Oil & Gas Leases/Hydroelectric Sites
Winter Range	
Pileated Woodpecker	**OTHER**
Pine Marten	Cultural Resources
Special Wildlife Areas	Transitory Range
THREATENED & ENDANGERED SPECIES	**RECREATION**
Bald Eagle (BEMA)	Developed Recreation Sites
T&E Plants	Potential Developed Recreation Site
	ROS Physical (Recreation Opportunity Spectrum)
VISUAL	Trails
Visual Absorption Capability (VAC)	WROS (Wilderness ROS)
Slope	
Viewsheds	
Existing Visual Condition (EVC)	
Visual Quality Objectives (VQO)	

Major uses of Inventory Data

Analysis Areas and Allocation Zones

The basic resource information and boundaries contained in the data layers of the mapping system are used to define the areas which are analyzed in the planning process. For the Forest, two levels of resource information were needed to adequately represent the planning problem: analysis areas and allocation zones.

Analysis areas represent aggregations of many individual areas which have similar characteristics and respond to management practices and activities in similar ways. The composition of an analysis area is important because it defines the range of management activities appropriate for a given objective and the resultant costs and yields. The analysis model FORPLAN assigns prescription to analysis areas based upon these costs and yields.

Analysis areas are constructed by overlaying several resource layers in the mapping system. These layers or combinations of layers become analysis area identifiers.

Overlaying all of the resources and boundary layers in the mapping system would result in tens of thousands of unique areas. Modeling limitations in FORPLAN require some grouping or condensing to arrive at a manageable number of analysis areas. In the DEIS model, allocation zones (watersheds) were used in concert with forest-wide analysis areas. For the FEIS, the watersheds were included in the analysis area identifiers; but big game winter range, slope class, soil stability and logging suitability were taken out of the analysis areas used by FORPLAN. Where these data were needed, they were included in the information provided to a side model or averaged across the watershed. *The Forest Planning Model* later in Appendix B contains more information on the development and composition of the analysis areas.

Production Coefficients

Analysis of the planning problem requires the development of production functions which are relationships between sets of inputs (i.e., activities and their costs) and outputs, effects, and conditions. The coefficients which represent these relationships were developed in a number of ways and from a variety of sources. In some cases, data representing several years experience were averaged. In other situations, historical data were not available or representative of anticipated practices, so estimates were made.

Computerized models were used to develop certain types of yields (e.g., timber yields from DP-DFSIM and PROGNOSIS). The Forest's grid mapping system (Mt. Hood version of R2MAP) aided in the construction of production coefficients in some cases by providing the acreages of specific categories within other more general categories. The derivation of production coefficients is discussed in more detail later in Appendix B in the Forest Planning Model section titled *Development of Yield Coefficients* and the *Economic Efficiency Analysis* section.

Timber Suitability

The Forest followed a process based on National and Regional direction to determine which lands are unsuitable for timber management. This process included a screen for regeneration difficulty. The Forest's soil resource inventory (SRI) was used to locate areas with potential regeneration difficulty. Unsuited soils became a layer in the Forest's Data Base and were used in defining analysis areas. A data base error was identified in the DEIS interpretation of the Soil Resource Inventory. Correcting the error for the FEIS analysis resulted in the addition of approximately 29,000 acres to the lands tentatively suitable for timber production. The Timber suitability process and results are presented in the FEIS, Chapter III.

Alternative Development and Analysis

Alternatives were developed to meet specific resource objectives or to follow a particular theme. The basic use of inventory data in this step was to accurately reflect the land base and provide the basis for scheduling activities and estimating outputs, costs and effects through the development of production coefficients. Inventories of potential land allocations or management areas were used as a basis for assigning prescriptions in each alternative. The Forest's Data Base greatly facilitated the task of identifying these areas and determining which prescriptions could be applied. This process is described more fully later in Appendix B, in the sections titled *The Forest Planning Model*, and *Formulation of Alternatives*.

Implementation and Monitoring

Inventory data will continue to be essential when the plan moves into the implementation and monitoring phases. Site-specific activities and projects will be scheduled based on the results of the Forest-wide planning process. Changes in the land base due to timber harvest, Congressional mandates and other major developments will guide future activity scheduling. Data collected to monitor activities and their effects will be stored to facilitate mid-course corrections and future analyses. More detail on these steps can be found in Chapter 5 of the Forest Plan.

Summary of Major Data Sources

Major data sources used in the planning process are divided according to mapping system data layers (Table B-1) and coefficient development/estimation of effects.

Mapping System Data Layers

1. The basic **soils** map was developed from the Forest's *Soil Resource Inventory* (SRI) which was conducted in 1971-72 and published in 1973.

2. **Unsuited soils** were identified in a Timberland Suitability study by the Forest's Soil Scientist in 1980 and revised in 1984.

3. Watershed **subdrainage boundaries** were mapped in 1980-81 by District personnel.

4. **Riparian zones** were identified from a "Stream Classification Map" developed in 1972 and revised in 1979.

5. The Forest's most recent **Timber inventory** (1981), subsequent updates (1984 and 1988) and analyses provided the Timber size and type information needed to describe the Forest's timbered vegetation.

6. **Commercial thinning accessibility** information was developed from 1982 topographic maps with updated road information from the transportation planners and Districts. The original mapping was done in 1982 and revised in 1984.

7. **Aerial logging** areas (inaccessible by ground based logging systems) were mapped by District timber staffs in 1982 and revised in 1983.

8. **Spotted Owl Habitat Areas** (SOHAs), each containing a verified pair of owls, have been identified in an on-going field inventory begun in 1979. The distribution and size of the areas has changed several times. For the FEIS a 1500 acre/pair network was developed in 1989.

9. **Winter range boundaries** for deer and elk were provided by District biologists from TRI information adjusted with field knowledge in 1982. The original boundaries in TRI were mapped in 1972 by the Forest Wildlife Biologist. (Updated with District biologists and Oregon Department of Fish and Wildlife input, 1989.)

10. **Pileated woodpecker** and **pine marten habitat areas** were mapped by the planning team wildlife biologist based on Regional Office direction which specified size, distributional and other habitat requirements. (Updated, 1989)

11. **Special wildlife habitat areas** were mapped by District wildlife biologists in 1983. (Updated, 1989)

12. Two existing **bald eagle territories** were mapped as a Threatened and Endangered Species habitat. Potential sites were mapped based on Regional Office criteria contained in a February 9, 1983 memo.

13. **Threatened, Endangered and Sensitive plants** on the Region 6 Sensitive Plant List were mapped based on 1979 and 1980 field inventories.

14. The ability of the Forest to absorb visual change, known as the **Visual Absorption Capability (VAC),** was mapped by the Forest Landscape Architect in 1980.

15. The **slope** map of the Forest was done by the Forest Landscape Architect in 1980 using topographic maps.

16. The VIEWIT Seen Area Program was used by the Forest Landscape Architect to develop **viewshed boundaries** along ten designated highways.

17. The **Existing Visual Condition (EVC)** inventory map which shows the appearance of the Forest at a particular point in time was developed from field inventories and the mapping system in 1984. (Updated, 1989)

18. **Visual Quality Objectives (VQO)** information was extracted from a map containing Composite Visual Quality Standards which were developed through a visual resource inventory in 1974.

19. **Existing developed recreation sites** were mapped based on information in the Recreation Information Management (RIM) System and reviewed and updated by District personnel in 1982 through 1984. (Updated, 1989)

20. **Potential developed recreation sites** were mapped based on information provided by the Districts including the number and kind of sites and size of development. (Updated, 1989)

21. The **types of recreation opportunities** available are described in terms of physical, social and managerial settings in the Recreation Opportunity Spectrum (ROS) System and are based on District inventories conducted in 1981. (Updated, 1989)

22. Mapping of **Wilderness Recreation Opportunity Spectrum** areas was done at a 1983 workshop with District personnel.

23. Transportation planners on the Forest provided information on **transportation collectorshed boundaries** in 1982.

24. **Rock sources for road building** were identified on maps prepared by geotechnical engineers on each Engineering Zone in 1981.

25. Known **mineral resources** on the Forest were obtained from the "Mineral Resource Map of Oregon", a 1984 publication by M. L. Fernes and D. F. Huber.

26. **Land ownership** within the National Forest boundaries was mapped in 1981 based on information in the *Land Status Atlas* and *Land Areas of the National Forest System.*

27. **Administrative boundaries** were also obtained from the two documents listed under land ownership as well as information contained in "Forest Facts, 1980" and Congressional Districts Map (1982).

28. **Wilderness boundaries** were obtained through inventory mapping in 1981 and revised to reflect the additions from the 1984 Oregon Wilderness Act.

29. The boundaries for established and proposed **Research Natural Areas (RNAs)** were taken from the existing Willamette National Forest Land Management Plan (1977) and mapped in 1981. (Updated, 1989)

30. All **roadless areas** identified in Forest plans and RARE II were mapped. Other areas that appeared to meet roadless criteria were also mapped in 1981. All roadless area boundaries were adjusted in 1984 to account for the 1984 Wilderness Act and an additional update was conducted in 1989 to reflect continuing road building and timber sales.

31. The boundaries for **Oregon and California (O&C) Grant Lands, stipulated mining claims, administrative sites and special use permits** were derived from the *Land Status Atlas.* The *Land Use Reporting System* (LUR) and special use permit files were also used as information sources for mapping special use boundaries.

32. The **current Land Management Plan** (1977) was mapped with periodic revisions to reflect allocation and acreage adjustments to the present.

33. **Special Interest Areas, National Natural Landmarks and Wild & Scenic Rivers** were mapped by the planning team in 1983-84 using information from the National Park Service, the Forest's current Land Management Plan, and District and staff input. (Updated, 1989)

34. Information about the known **geothermal resource** was provided by the Lands and Minerals Staff, mapped in 1981 and updated in 1984.

35. The *Land Status Atlas* provided information on **existing hydroelectric sites. Oil and gas lease areas** were obtained from descriptions in applications provided by the Lands and Minerals Staff in 1984.

36. **Prehistoric and historic cultural sites** were mapped in 1982 and updated in 1989.

37. **Trail system** information was obtained from the Trail System Inventory updated by District personnel. (Updated, 1989)

Coefficient Development/Estimation of Effects

1. Codes and definitions for most activities, outputs and effects come from the Forest Service's National Activity Structure Handbook (FSH 1309.16).

2. Timber values were obtained from the Timber Sale Statement of Accounts Data Base and represent the value of Timber harvested from April, 1977 through September, 1983.

3. Other resource values are taken from the 1985 Forest and Rangeland Renewable Resources Planning Act (RPA) Program Update per Regional Office direction (1920 letter of April 27, 1984) and FSM 1971.64.

4. Cost information was developed from multi-year averages of actual expenditure data from the PAMARS Data Base, submission to the 1985 RPA Program Update, and Staff or specialist estimates.

5. Existing stand timber yield tables were developed from volume and growth information by species from the 1981 Forest timber inventory.

6. Managed stand timber yield tables were developed using two growth and yield models: Dynamic Programming Douglas-fir Simulator (DP-DFSIM) for low elevation species and PROGNOSIS for high elevation species.

7. Salvable dead volume coefficients were obtained from the 1981 timber inventory.

8. Percentage increases for volumes (in addition to net green) available from natural stands were developed from Cut and Sold Reports (e.g.,nonchargeable cull and other convertible products) and the Timber Inventory Adjustment Record (e.g., chargeable dead salvage and unregulated).

9. Dispersed recreation capacity coefficients were estimated by Recreation Opportunity Spectrum (ROS) class based on the procedures outlined in the ROS Users Guide (FSH 2309.13).

10. Wilderness capacity coefficients were developed through the use of WRS class standards, Wilderness specific data, and limits of acceptable change (LAC) considerations.

11. The RIM System provided the information needed to determine developed site capacity estimates and was the basis for making recreational use projections for all sites and areas on the Forest by alternative.

12. Social and Economic Statistics and a description of the local economy were obtained from the Forest's Socio-Economic Overview and updated with current figures from the State of Oregon, Employment Division.

13. National and county data files describing local county economies and inter-industry transactions that occur as goods are produced and sold formed the base data used by the input-output model IMPLAN which predicts local economic impacts of alternatives.

14. Road construction rates were developed through computer analyses which generate roading estimates based on variable harvest rates associated with the amount of land available and suited for timber production in each watershed, roadless area, and management area.

15. Erosion production rates based on Willamette National Forest SRI types were developed through a study contracted to the Pacific Northwest Forest Research Station. These rates were then converted to erosion coefficients specific to slope and soil stability classes for use in the planning model.

16. Wildlife and Fish user days (WFUDs) were calculated from historic average proportions of past total use levels which were obtained from the RIM System.

17. Habitat capability for big game was generated by a computer program based on "A Model to Evaluate Elk Habitat in Western Oregon" (Wisdom, et al. 1988)

18. Activity, output, and effect data for the No Change Alternative were in part derived from the current Forest Multiple-Use and Timber Management Plan (1977).

THE FOREST PLANNING MODEL (FORPLAN)

OVERVIEW

Forest planning is a very complex process in which an enormous amount of information must be considered before an alternative management plan can be recommended as the one which best addresses the issues, concerns, and opportunities identified at the outset of the planning process. Because of this complexity, several interrelated computer models and analytical tools have been developed and utilized to help determine the decision space within which alternatives can be developed, and to evaluate their associated outputs and effects.

One of these models is called FORPLAN. The name is an acronym for FORest PLANning model. FORPLAN is a computerized linear programming (LP) model which has its roots in the Resource Allocation model (RAM) and Multiple-Use Sustained Yield Calculations (MUSYC) models. It is composed of a matrix generator, a linear programming solution system (FMPS), and a report writer. Within the bounds of the matrix generator and the FMPS solution package, the user is allowed a great deal of latitude in formulating the mathematical representation of the Forest planning problem to be analyzed. The Forest's modeling analysis was performed with the Version II, DEO-TEST model. The system is maintained and operated on the Department of Agriculture Univac computer at Fort Collins, Colorado and has been adapted for use on MS-DOS based personal computers by the U.S. Forest Service's Rocky Mountain Forest and Range Experiment Station.

The FORPLAN model was specifically designed to help the IDT analyze the economic and production trade-offs associated with the recreation, timber, scenic, old-growth, water, roadless, and wildlife resources, and to help evaluate the extent to which various alternative management scenarios were able to address and resolve the identified planning issues. One key step in the development of the FORPLAN model was to divide the total Forest into analysis areas. Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed in the FORPLAN model. Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies. The focus of the delineations was upon the planning issues.

In the FORPLAN model, analysis areas were assigned prescriptions in order to achieve the resource management objectives of a particular benchmark analysis or alternative. Prescriptions are directly related to the management areas described in Chapter II. Two major categories of prescriptions were used in the analysis. Management prescriptions contain the standards and guidelines necessary to meet the multiple-use objectives of each management area. These prescriptions are contained within the Proposed Forest Plan document, Chapter IV. The second category of prescriptions, called FORPLAN prescriptions, contain the details necessary to model the management prescriptions in FORPLAN, and to schedule activities in a cost-efficient manner.

FORPLAN prescriptions are combinations of scheduled activities and practices, and their associated outputs and effects. These prescriptions and their range of timing choices are represented as decision variables in FORPLAN. The outputs and effects associated with the prescription choices are represented as mathematical coefficients in the respective decision variables.

FORPLAN prescriptions are represented at three levels within FORPLAN. At the first level, a set of management emphases parallel the management prescriptions. Second, within many management emphases a set of management intensities are represented as choices in the FORPLAN model. These intensities depict different combinations of activities such as timber harvesting, planting, commercial thinning, etc. At the third level, dozens of different timing patterns and rotation ages were provided for most management emphasis-management intensity combinations on timbered lands.

Operation of the FORPLAN model was designed to ensure that prescriptions were selected in a cost-efficient manner. The prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative. The objective function is a mathematical equation which shows how the Forest's objective (maximize present net value or maximize timber production, for example) is affected by the variable values explicitly portrayed in alternative management prescriptions. Constraints are mathematical equations which require that a given amount of an input or output variable be achieved. The given amount is also termed the right-hand side (RHS) due to its location within typical linear programming matrix representation. All constraints must be satisfied before an optimal solution to the objective function is reached.

The objective function was usually to maximize present net value (PNV) or maximize the production of timber. These were subject to first satisfying all the specified constraints. Constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple-use objectives of a benchmark or alternative. Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

Analysis Process and Analytical Tools Used

As directed in the Planning Regulations (36 CFR 219.12(f)(8)):

> "Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative."

This direction provided overall guidance to the entire analysis process. The IDT analyzed economic efficiency at several stages of the planning process in order to be reasonably assured that the alternatives developed and displayed in the Draft EIS complied with the intent of this direction. The discussion of the analytical process and tools used will follow this general outline:

1. Analysis prior to FORPLAN,
2. How FORPLAN was used in the analysis,
3. Analysis done in addition to FORPLAN model analysis.

Analysis Prior To FORPLAN

The analysis process began with the identification of issues, concerns, and opportunities. The Forest planning team developed an initial set of issues based on an "objectives hierarchy." This structure of objectives tied together both general and specific resource objectives into an understandable and comprehensive format. These issues were then mailed out to the public. General feedback concerning these issues as well as specific responses on the relative importance of the issues was requested. These responses were then analyzed and relative weights assigned to the issues. The objectives hierarchy

and issue descriptions were then modified, based upon public input, and formed the basis for the final Forest issues.

Once the issues, concerns, and opportunities were identified, the Interdisciplinary Team began to formulate management prescriptions and their associated standards and guidelines. This step was probably one of the most difficult and laborious, and possibly the most important task of the interdisciplinary planning process. Management areas coupled with their respective standards and guidelines provide specific direction for implementation, and serve as a framework for how to use, develop and protect the Forest's resources in a manner consistent with the goals and objectives of the various alternatives.

Since the standards and guidelines provide general, rather than site or project specific direction on how to implement the final Forest Plan, little opportunity was available to calculate a present net value (PNV) or benefit/cost ratio for many of them. However, economic efficiency was a strong consideration throughout their development. For example, standards and guidelines for logging system selection list economic considerations as a major criterion. Similarly, timber haul rates and timing must be cost-effective. Intensive timber management prescriptions call for "obtaining the greatest economic return consistent with other resource requirements."

Much of the analysis prior to FORPLAN involved decisions that needed to be made in the design and construction of the FORPLAN model. Concurrently with the formulation of management areas and the standards and guidelines, the IDT also began to identify the analysis areas that would be used in the FORPLAN model. The Forest's grid cell data base was used extensively to analyze different analysis area combinations that could be used to model and evaluate the production and economic trade-offs between the recreation, roadless, timber, water, scenic, old-growth, and wildlife resources on the Forest. The objective of this exercise for the DEIS analysis was to delineate the analysis areas in such a way as to capture the important variations in the biological and economic characteristics of the land in as few analysis areas as possible.

Many of the decisions that were necessary to reduce the number of analysis areas for the DEIS analysis were made unnecessary through the use of relational data base tools in conjunction with the Forest's grid mapping system. Complete detail was maintained in the analysis areas until after the management strategies were combined and the data processed through the side model, "VISPLAN", developed by the Pacific Northwest Regional Office. VISPLAN provided details on the availability and average volume per acre for lands in all strategies with a limited final harvest entry per decade (up to 12% per decade). Based on VISPLAN output, the analysis areas for all strategies except the "general forest" strategy were collapsed, constraints were written for harvesting limited entry areas, and special yield tables were written to accurately reflect the average volume per acre for harvests in the limited entry strategy areas. Final analysis area delineators were focused upon depicting timber production and economic differences.

Once the final analysis area delineation was settled upon, the next step was to develop the prescriptions for the FORPLAN model. This included the development of timber yield tables, other resource yield coefficients, and the economic costs and benefits associated with each FORPLAN prescription. These prescriptions were designed to enable FORPLAN to analyze the economic and resource trade-offs associated with a particular benchmark or alternative, and to select and schedule prescriptions in a cost-efficient manner.

FORPLAN prescriptions are combinations of scheduled activities and practices, and their associated outputs and effects. These prescriptions and their range of timing choices are represented as decision

variables in FORPLAN. The outputs and effects associated with the prescription choices are represented as mathematical coefficients in the respective decision variables.

FORPLAN prescriptions are represented at three levels within FORPLAN. At the first level, a set of management emphases parallel the management prescriptions. Within many management emphases a set of management intensities are represented as choices in the FORPLAN model. These intensities depict different combinations of activities such as timber harvesting, planting, commercial thinning, etc. At the third level, dozens of different timing patterns and rotation ages were provided for most management emphasis and management intensity combinations on timbered lands.

In designing the FORPLAN model considerable effort was expended in developing the management intensities to be used for each management prescription, and in determining the timing choices to be used for each management intensity. A dynamic programming model, DP-DFSIM, was used to develop timber management regimes that were most efficient in meeting different criteria (e.g., maximum timber volume, and maximum PNV). In addition to these maximums, a wide range of timber yield tables was developed to provide FORPLAN with the harvest scheduling flexibility needed to satisfy the multiple-use objectives of each alternative, and to find the most efficient solution. The complete set of management intensities was also analyzed in terms of present net value on a per acre basis. The final set of intensities selected were based on silvicultural considerations, economic criteria, multiple resource objectives, and the need to provide a wide range of choice for FORPLAN. An entire section, titled *Development of Management Prescriptions and Intensities*, appears later in Appendix B and contains the details of these analyses and the analysis of timing patterns to be allowed.

Another analysis done prior to FORPLAN for some alternatives in the FEIS has been termed the "Spatial Disaggregation Process" (SDP). The same process can be used (depending on the alternatives objectives) to meet hydrologic recovery goals by writing FORPLAN constraints or to measure the effects of timber harvest on hydrologic recovery after FORPLAN has found an optimal solution. The Spatial Disaggregation Process begins with the analysis area information and adds geographically specific data from the mapping system for the factors affecting water quality and the dispersion of created openings. Using this detail, the SDP finds the one most constraining factor for each sub-drainage (there are 454 unique geographically located sub-drainages). When SDP is used to distribute and limit hydrologic recovery, the acres available by sub-drainage are totaled by watershed to generate FORPLAN constraints. When SDP is used to analyze a FORPLAN solution, it estimates the relative risks of violating standards and guidelines for harvest unit location and water quality risks based on hydrologic recovery measures.

FORPLAN Analysis

FORPLAN was used for three principal purposes in the analysis. The first use was to identify the maximum or optimum method of meeting a single objective. This was done primarily in the formulation of benchmarks as part of the Analysis of the Management Situation. The objectives of focus were maximizing present net value (using all values, and using market values only), maximizing timber production, and maximizing recreation opportunities. In all of these benchmarks a review of the implications on the resources not being emphasized was a key concern of the analysis.

The second principal use of FORPLAN was to assess implications of particular policy decisions. This was also primarily done in the context of the maximum PNV benchmark (using all values). In this case, a comparison of FORPLAN results with and without the particular policy feature was used to estimate the impacts associated with the implementation of the policy in question. Among the specific policies examined this way were minimum management requirements (MRs) (including specific comparisons on wildlife MRs, spotted owl MRs, riparian MRs, and spatial dispersion requirements),

departure versus nondeclining flow schedules, limiting first entry rotation ages to 95% of the culmination of mean annual increment, and the impact of different economic assumptions.

The most important use of FORPLAN was in the development of alternatives. Since alternatives are generally multiresource oriented, the FORPLAN model served to identify the most efficient method to achieve, simultaneously, a number of different management objectives. During alternative modeling interaction of constraints was watched closely to ensure achievement and avoid overachievement of the intended objectives of the constraints being modeled. FORPLAN was also used to identify effects of the alternatives on particular areas of resource concern.

The prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative. The objective function is a mathematical equation which shows how the Forest's objective (maximize present net value or maximize timber production, for example) is affected by the variable values explicitly portrayed in alternative management prescriptions. Constraints are mathematical equations which require that a given amount of an input or output variable be achieved. The given amount is also termed the right-hand side (RHS) due to its location within typical linear programming matrix representations. All constraints must be satisfied before an optimal solution to the objective function is reached.

The objective function was usually to maximize present net value (PNV) or maximize the production of timber. These were subject to first satisfying all the specified constraints. Constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve the multiple-use objectives of a benchmark or alternative. Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

Analysis In Addition To FORPLAN

Although many of the outputs and effects displayed in the Draft EIS were calculated directly by FORPLAN, many others were developed through post-FORPLAN modeling processes. Generally, these processes either integrated several factors derived from multiple sources, or required a specific type of disaggregation of model results. The major outputs or effects analyzed by post-FORPLAN processes were fish and wildlife, water, economics, transportation needs, and roadless areas.

The FORPLAN solution was disaggregated to each analysis area and management strategy combination by special report writers maintained by the Pacific Northwest Regional Office and by a data base software package (Paradox) for MS-DOS computers. Coefficients for many of the outputs and effects that were not directly reported by FORPLAN were assigned using relational data base techniques and the SDP was employed to asses the effects of timber harvest levels on hydrologic recovery. Most of the recreation estimates and the economic summaries were calculated using electronic spreadsheets.

Estimation of economic effects also required additional analysis after FORPLAN. The IMPLAN model was used to estimate the effects of the alternatives on county level jobs and personal income. Outputs from FORPLAN, primarily timber and recreation, provided the basic input to IMPLAN. The section titled *Social and Economic Impact Analysis* of this appendix provides more detail on the IMPLAN model. Electronic spreadsheets were used to fully calculate PNV, resource contributions to benefits and costs, and the necessary budgets for benchmarks and alternatives.

Analysis of transportation system needs and of resource outputs and effects within roadless areas both required specific disaggregations of FORPLAN outputs. FORPLAN timber volumes were distributed to transportation "collectorsheds" for estimation of road mileages needed. An electronic spreadsheet was used to derive estimates of outputs and effects within each roadless area.

FOREST PLANNING MODEL

Identification of Analysis Areas

Overview

Analysis areas serve as the basic land stratification in FORPLAN. They help to describe the Forest land base so that different management options can be analyzed. Analysis areas are a part of the basic decision variable used in the linear program (LP). The other component of the decision variable involves the prescription that is applied to the analysis area. A range of prescriptions are defined for each analysis area. The linear program optimizes over all prescriptions to provide the most efficient combination of prescriptions for each analysis area given the constraints.

As the basic land stratification, analysis areas (AAs) serve several functions in FORPLAN.

1. AAs allow the Forest to be stratified so that management prescriptions may be applied based on different land characteristics. These characteristics help in defining appropriate management activities and their associated costs. The land characteristics can also help to predict the effects of undertaking these activities (the resource yields produced and any financial value they may represent).

2. AAs allow the Forest to be stratified so that management activities and/or resource yields may be constrained to specified levels, fluctuations over time, or relative levels (based on other activities or yields).

3. AAs allow the Forest to be stratified so that management activities or resource yields may be summarized and reported by different geographic areas or vegetative conditions on the Forest.

Level Identifiers

AAs are defined by six levels of information. The six levels are mapped and overlayed to form unique, homogeneous units. Each of the six levels will be discussed summarizing the reasons why the resource information was chosen, and its function in the analysis process. All resource inventory maps used in developing analysis areas have been coded into the Forest grid cell map data base at 1-inch equals 1-mile scale. This equates to a grid cell size of 21.33 acres.

Level 1: Watershed - Watershed delineation was chosen as the identifier or information for the first level of Forest stratification. It is a spatial representation of data. The watershed delineation is comparable to the allocation zones used in the DEIS analysis. Some of the specific boundaries were adjusted to follow district boundaries or to more accurately segregate areas with unique hydrologic or geomorphic conditions. This geographic information is used with other FORPLAN identifiers and other map layers to estimate average production coefficients for FORPLAN or other models that are used to estimate outputs and effects.

Level 2: Not Used

Level 3: Not Used

Level 4: Silvicultural Suitability - Level 4 contains a composite of information that shows where commercial thinning and fertilization are feasible. A full range of timber harvest prescriptions were developed from which the FORPLAN model could select. Areas that are suitable for commercial thinning and fertilization opportunities were identified so that the management costs, growth, and timber yields are accurately reflected in each management prescription.

Areas that are considered accessible for commercial thinning are those that can be reached from either an existing or proposed road within the capability of existing logging equipment. This was assumed to occur a given number of horizontal feet from a road depending upon its topographic location:

Valley roads	-	300 feet each side
Ridge top roads	-	1,200 feet each side
Hillside road	-	300 feet uphill/1,200 feet downhill

Transportation plans and information from the Districts were used to map the existing and proposed road network on 1-inch to the mile topographic maps. The area accessible around each type of road was then mapped based on the horizontal width criteria. See "Accessibility for Commercial Thinning" (Megargel 1982) for more information about development of this layer.

Fertilization opportunities were derived from the soil inventory for the DEIS analysis. The assumptions for fertilization response have changed between the DEIS and FEIS. For the DEIS, only the 19 soil types which had been tested for fertilization response were included in the "responds to fertilizer" classification. For the FEIS analysis, all of the predominantly Douglas fir (60% or greater) timber type lands were assumed to "respond to fertilizer" applications. The actual amount of response predicted is taken from fertilizer response predictions in the yield simulator.

Table B-2. Assignment of Timber Management Intensities

	Analysis Area Identifier			
	Accessible		Not Accessible	
	Response	No Response	Response	No Response
T-1A Minimum Investment	X	X	X	X
T-1B Minimum Investment with Early Entry	-	X	-	-
T-1C Early Entry with Fertilization	X	-	-	-
T-2 Moderate Investment	-	X	-	X
A-2 Moderate Investment and Fertilization	X	-	X	-
T-3 Full Stocking Level Control	X	X	-	-
T-4 High Investment	X	-	-	-

X Indicates the timber intensity allowed for the analysis area identifier combination.

Timber management intensities available for selection are based, in part, upon accessibility to commercial thinning and fertilization response. Table B-2 shows which intensities are available according to analysis area identifiers. Management intensities that require fertilization will only be an option in areas that show response. Only areas accessible will have the choice of the management intensities that prescribe commercial thinning. Regardless of which logging system happens to overlap with accessible areas, only skyline systems were used in modeling commercial thinning. The majority of thinning done on the Forest utilizes skyline systems. The yield table analysis (Sanders, et al. 1985) showed that thinning with aerial systems was not economically viable. Thinning using ground-based systems is not commonly used.

The timing of thinning and fertilization depends upon timber type association and size class represented in Levels 5 and 6. The "Timber Yield Table Documentation" (Sanders, et al. 1985) process paper gives a detailed description of yield table development.

Level 5: Timber Type - Analysis of the timber production capabilities of the Forest is dependent upon knowing the status of the existing timber inventory, and of the potential growth a site is capable of producing in the future. The timber type association is an important vegetative stratification used to categorize differences and summarize data.

Timber type associations were taken from the four inch to the mile timber type map developed for the 1981 timber inventory. The inventory sampled plots that were stratified based on the Forest's Aggregated Timber Type Model. The model describes the vegetation conditions of timber stands according to the predominant commercial timber species and size class. Five timber type associations were represented in the sampling model:

1. *Douglas fir/western hemlock* - catch-all category for the western hemlock zone;
2. *Douglas fir/true fir* - stands with some true fir, indicating a cooler site than western hemlock;
3. *True fir association* - catch-all category for silver fir zone, with less than 20% Douglas fir;
4. *Mountain hemlock* - stands dominated by mountain hemlock, no noble fir present;
5. *Lodgepole pine* - pure or nearly pure lodgepole pine stands of any size or stocking.

The "Process Documentation for Timber Resource Inventory" (Sloan et al. 1983) describes the timber typing and inventory in detail.

Timber type associations help determine the economics of timber production since the average dollar return per unit volume harvested differs depending upon the species mix. Timber types are also important in estimating wildlife indicator species populations. The Douglas fir/western hemlock association was used in analyzing the hydrologic condition of watersheds. Existing timber inventory and future growth rates also vary by timber type.

Non-forest areas that are less than 10% tree cover, water, rock, or barrens are identified in the timber type class information. Forest cover types are reported for unsuitable lands, withdrawn lands, and for Douglas fir/hemlock lands on non-National Forest. This information is used for estimating both dead tree habitat and hydrologic conditions for each watershed.

Level 6: Timber Size - The last level in the analysis area stratification includes the existing timber size information. This information was taken from the timber typing done for the 1981 timber inventory.

Five size classes were represented for sampling inventory plots based on the Aggregated Timber Type Model (Sloan, et al. 1983):

1. *Seedlings and Saplings/nonstocked* - 0 to 4.9 inches diameter;

2. *Pole Timber* - 5 inches to 8.9 inches;

3. *Small Sawtimber* - 9.0 inch to 20.9 inches diameter, mainly young growth;

4. *Large Sawtimber* - 21 inches diameter and larger;

5. *Old-growth Timber* - 21 inches diameter and larger, usually over 180 years old. Trees are characterized by deeply furrowed bark, ragged tops, and limb clusters in lieu of individual limbs.

The seedling and sapling size strata was not sampled since the inventory plots were not designed to sample vegetation in this size class. After the field work was done in 1981, empirical timber yield tables were developed for each of the type/size combinations. As the timber yield tables were developed, the mountain hemlock and lodgepole pine components were combined into one size class for purposes of timber yield estimation. The plot information showed a mixture of species within the lodgepole pine type, and since the strata is a mountain hemlock climax type, it was combined with the mountain hemlock poles. The two empirical tables were weighted together based upon the suited acres in each strata.

The inventory analysis showed the per acre yields between the large sawtimber and old growth strata were not statistically different. For the DEIS these two size classes were combined. However, public comment received after the DEIS was released cited the importance of correctly identifying old-growth stand characteristics, and there was some concern that the Forest was losing the ability to identify existing old growth. In response, a new inventory was done with the major objective of identifying stand characteristics. The new inventory was named for the type of stands that were to be sampled and is commonly referred to as the Mature/OverMature Survey (MOMS). The survey data allows identification of old growth based on a variety of possible definitions or stand characteristics.

The timber size information that was delineated for the 1981 inventory was current up to January 1980. To represent a more accurate timber inventory, this was updated twice for the DEIS. The timber size class data was again updated for the FEIS (from 1985 to 1989). Also in response to public comments, the seeds/saps size classes were disaggregated into four 10 year age groups by species, using information in the Total Resource Information (TRI) system and the mapping done as part of the Mature and Overmature survey. Average ages now are 10, 20, 30 or 40 years near the midpoint of the first planning decade (1994). This disaggreagation is used only for the Douglas fir timber types. The true fir association, mountain hemlock and lodgepole pine timber types are represented by one age class for the seedlings and saplings up to 40 years old. More information on the process of updating the timber size class information can be found in the planning records, available for public review at the Forest Supervisor's Office.

The timber inventory established an average site index and age for each type and size strata. The average site index gives an indication of future growth potential. It was used in developing managed timber yield tables. The average age is used to assign appropriate prescriptions for the first decade of the planning horizon. The assigned ages are shown in Table B-3.

Table B-3. Analysis Area Ages

Timber Type	Timber Size	Age in Years
Douglas fir/hemlock	10-year-old	10
	20-year-old	20
	30-year-old	30
	40-year-old	40
	Poles	60
	Small sawtimber	120
	Large sawtimber	180
	Old growth	240
Douglas fir/true fir	10-year-old	10
	20-year-old	20
	30-year-old	30
	40-year-old	40
	Poles	50
	Small sawtimber	160
	Large sawtimber	190
	Old growth	230
True fir	10 to 40-year-old	20
	Poles	140
	Small sawtimber	160
	Large sawtimber	220
Mountain hemlock/lodgepole	10 to 40-year-old	20
	Poles	160
	Large sawtimber	220

The nonstocked component of the seedling and saplings is not identified separately, but it was recognized through a yield falldown applied to managed timber yield tables applicable to this size class. For documentation on identification of physically unsuited lands, see "Willamette National Forest: Timberland Suitability Documentation" (Mayo and Bernat 1984).

Conclusion

For further discussion of the resource layers used in the level identifiers, see "Data Base Documentation" (Bernat 1984). This process document describes how the source maps were derived and coded into the grid cell map system.

The levels of information that make up the analysis areas are composed of basic geographic, soil, and timber stand characteristics. This information serves in applying appropriate prescriptions and in predicting and constraining resource yields to land areas.

Table B-4 shows the final set of analysis area identifiers that were used to represent the Forest in the FORPLAN model.

Table B-4. FORPLAN Identifiers

*LEVEL 1 WATERSHED
10: BLUE RIVER
92: BREITENBUSH RIVER
15: FALL CREEK
22: HILLS CREEK
14: LOWER HORSE CREEK
01: LITTLE NORTH SANTIAM
07: MCKENZIE RIVER
11: MCKENZIE LOWER TRIBUTARIES
13: MCKENZIE (SOUTH FORK)
05: MIDDLE SANTIAM
77: NORTH SANTIAM/BLOWOUT/WOODPECKER
78: LOWER NORTH SANTIAM
79: UPPER NORTH SANTIAM
12: QUARTZ CREEK
04: QUARTZVILLE
18: SALMON CREEK
20: SALT CREEK
06: SOUTH SANTIAM
16: WINBERRY CREEK
21: LOWER M.F. OF THE WILLAMETTE
23: UPPER MIDDLE FORK WILLAMETTE
19: WILLAMETTE (TRIBS OF THE MIDDLE FORK)
17: WILLAMETTE (NORTH FORK OF THE MF)
24: WILLAMETTE (UPPER NORTH FORK OF MF)
00: LOOKOUT CREEK
03: TRIBUTARIES OF DETROIT RES.
09: CALAPOOIA AND WILEY CREEKS
31: WILDERNESS LAKES
41: UPPER HORSE CREEK
61: CANYON CREEK
71: HACKLEMAN CREEK
72: SCOTT CREEK
73: DEER CREEK

*LEVEL 2 NOT USED

*LEVEL 3 NOT USED

*LEVEL 4 SILVICULTURAL SUITABILITY
CR: ACCESSIBLE FOR THINNING - FERTILIZATION RESPONSE
CN: ACCESSIBLE FOR THINNING - NO FERTILIZATION RESPONSE
NR: NOT ACCESSIBLE FOR THINNING - FERTILIZATION RESPONSE
NN: NOT ACCESSIBLE FOR THINNING - NO FERTILIZATION RESPONSE
RD: ACRES OF ROADS
NO: NON-FORESTED NF LAND
UW: WITHDRAWN & UNSUITABLE FS LAND
PP: NON-FS LANDS

*LEVEL 5 TIMBER TYPE
DH: DOUGLAS-FIR/WESTERN HEMLOCK
FD: DOUGLAS-FIR/TRUE FIR
FA: TRUE FIR ASSOCIATION
MH: MOUNTAIN HEMLOCK/LODGEPOLE PINE
NF: ALL NON-FORESTED LANDS
RD: ACRES OF ROADS
PD: DH ON NON-FS LANDS
PO: NON-DH ON NON-FS LANDS
RI: RIPARIAN WITHDRAWN

*LEVEL 6 TIMBER SIZE
10: STANDS HARVESTED FROM 1977 TO 1989
20: STANDS HARVESTED FROM 1967 TO 1976
30: STANDS HARVESTED FROM 1957 TO 1966
40: STANDS HARVESTED FROM 1947 TO 1956
SS: SEEDLINGS & SAPLINGS NOT IN 10-40
PL: POLE STANDS
MS: MEDIUM SAWTIMBER STANDS
LS: LARGE SAWTIMBER STANDS
OG: OLD GROWTH (TIMBER DEFINITION)
NF: OTHER - ROCK,BARREN,GRASS,WATER
UW: FORESTED AREAS NOT HARVESTABLE
PP: NON-FS LANDS
RD: ACRES OF ROADS

DEVELOPMENT OF MANAGEMENT PRESCRIPTIONS AND INTENSITIES

Overview

In the FORPLAN model analysis areas were assigned prescriptions in order to achieve the resource management objectives of a particular benchmark analysis or alternative. Prescriptions are directly related to the management areas described in Chapter II. Two major categories of prescriptions were used in the analysis. Management prescriptions contain the standards and guidelines necessary to meet the multiple-use objectives of each management area. These prescriptions are contained within the Proposed Forest Plan document, Chapter IV. The second category of prescriptions, called FORPLAN prescriptions, contain the details necessary to model the management prescriptions in FORPLAN, and to schedule activities in a cost-efficient manner.

The National Forest Management Act (NFMA) regulations define management prescriptions as "management practices selected and scheduled for application on a specific area to attain multiple use and other goals and objectives" (36 CFR 219.3). Management prescriptions consist of a goal statement which establishes the purpose of the prescription, and a compatible set of management practices designed to develop and/or protect some combination of resources, and create or perpetuate a desired condition. The standards and guidelines that form the prescriptions were constructed within the requirements specified in 36 CFR 219.27. These requirements guide the development, analysis, approval, implementation, monitoring and evaluation of Forest Plans with regard to:

- Resource protection;
- Vegetative manipulation;
- Silvicultural practices;
- Even-aged management;
- Riparian areas;
- Soil and water; and
- Diversity.

These prescriptions represent a range of management direction, intensity, practices, standards and guidelines. The IDT included the necessary mitigation measures and resource coordination measures that are required to satisfy economic, legal, and social constraints when implementing these prescriptions. The documentation of these measures are found in the Standards and Guidelines of the Forest Plan.

The prescription development and screening process will be presented in detail in the next two sections. The next section will discuss management prescriptions: the process used to construct them; the goals and objectives of the prescriptions; and a standard and guideline comparison table. Following that is a discussion of the FORPLAN prescriptions: the process used to construct and screen timber options; the effects of assumptions made in the screening process; and the prescriptions used.

Management Prescriptions

The Forest uses 38 different management area themes for this FEIS and Plan. A range of prescriptions were developed to analyze alternate ways of managing the unique resources that exist in each management area. Each prescription was evaluated for its interaction and representation in FORPLAN. As the FORPLAN model was developed, many of the management areas were found to contain standards and guidelines that could be accurately represented with only a few FORPLAN "emphases". Table B-5 shows the relationship between management areas, standards and guidelines, and FORPLAN emphasis.

Table B-5. Standard and Guidelines and FORPLAN

Management Area	ROS Class	Recreation Management	Visual Management	Fish and Wildlife Management	Vegetation Management	Timber Management	Road Management	FORPLAN Code
1A	W-TRAN	HI-LIM	PRES	LIM	NAT	NONE	NONE	00
1B	W-SP	MOD-LIM	PRES	LIM	NAT	NONE	NONE	00
1C	W-PT	LO-LIM	PRES	LIM	NAT	NONE	NONE	00
1D	W-PTL	VLO-NONE	PRES	LIM	NAT	NONE	NONE	00
2A	SPM	MOD-LIM	PRES	LIM	NAT	UNREG	LIM-REC	00
2B	SPNM	LO-LIM	PRES	LIM	NAT	UNREG	NONE	00
3	RM	LO-NONE	MOD	RES	RES	RES	RES	00
5A	RN	LO-LIM	PRES	LIM	NAT	UNREG	NONE	00
5B	RN	LO-DEV	RET	LIM	NAT	UNREG	NONE	00
6A	SPNM	LO-LIM	RET	LIM	TIM	HAR-5	LIM-VIS	00
6B	RN	MOD-LIM	RET	LIM	TIM	HAR-5	LIM-VIS	55
6C	RN	MOD-LIM	PAR	LIM	TIM	HAR-7	LIM-VIS	77
7A	RN	LO-NONE	PRES	LIM	NAT	UNREG	NONE	00
8	RN	LO-NONE	RET	EAGLE	NAT	UNREG	LIM-WLD	00
9A	RN	LO-LIM	PRES	PROT	NAT	UNREG	LIM-WLD	00
9B	RN	LO-LIM	RET	ENH	NAT	UNREG	LIM-WLD	00
9C	RN	LO-LIM	PRES	PROT	NAT	UNREG	LIM-WLD	00
9D	RN	LO-DEV	RET	ENH	NAT	UNREG	LIM-WLD	00
10A	RN	MOD-DEV	PAR	LIM	TIM	HAR-10	EFF	10
10B	SPM	MOD-DEV	PAR	LIM	TIM	HAR-7	LIM-REC	77
10C	SPM	MOD-DEV	PRES	LIM	NAT	UNREG	NONE	00
10D	SPNM	MOD-LIM	RET	LIM	TIM	HAR-5	NONE	55
10E	SPNM	MOD-LIM	PRES	LIM	NAT	UNREG	NONE	00
10F	RN	MOD-LIM	RET	PROT	NAT	UNREG	NONE	00
11A	RM	LO-LIM	MOD	LIM	TIM	HAR-12	LIM-VIS	12
11B	RM	LO-LIM	MOD	LIM	TIM	HAR-10	LIM-VIS	10
11C	RN	LO-LIM	PAR	LIM	TIM	HAR-10	LIM-VIS	10
11D	RN	LO-LIM	PAR	LIM	TIM	HAR-7	LIM-VIS	77
11E	RN	LO-LIM	RET	LIM	TIM	HAR-7	LIM-VIS	77
11F	RN	LO-LIM	RET	LIM	TIM	HAR-5	LIM-VIS	55
12A	RN	HI-LIM	PAR	LIM	NAT	UNREG	LIM-REC	00
12B	RN	HI-DEV	PAR	LIM	NAT	UNREG	LIM-REC	00
13A	VAR	VAR	VAR	VAR	VAR	UNREG	VAR	00
13B	VAR	VAR	VAR	VAR	VAR	UNREG	VAR	00
14A	RM	MOD-LIM	MAX-MOD	LIM	TIM	FULL	EFF	TI
15	RN	VAR	PAR	PROT	NAT	UNREG	RES	00

Legend for Table B-5

MANAGEMENT AREAS

1	Wilderness
2	Oregon Cascades Recreation Area
3	H. J. Andrews Experimental Forest
4	Research Natural Areas
5	Special Interest Areas
6	Wild, Scenic and Recreational Rivers
7	Old-Growth Grove
8	Threatened and Endangered Species
9	Special Habitat
10	Dispersed Recreation
11	Scenic
12	Developed Recreation
13	Special & Administrative Use
14	General Forest
15	Riparian

ROS CLASS

W-TRAN	WILDERNESS - TRANSITION ZONE
W-SP	WILDERNESS - SEMIPRIMITIVE ZONE
W-PT	WILDERNESS - PRIMITIVE TRAILED ZONE
W-PTL	WILDERNESS - PRIMITIVE TRAILESS ZONE
SPNM	SEMIPRIMITIVE NONMOTORIZED
SPM	SEMIPRIMITIVE MOTORIZED
RN	ROADED NATURAL
RM	ROADED MODIFIED
VAR	VARIABLE

RECREATION MANAGEMENT

VLO-NONE	VERY LOW CONTACT WITH OTHER USERS - NO FURTHER DEVELOPMENT PLANNED
LO-NONE	LOW CONTACT WITH OTHER USERS - NO FURTHER DEVELOPMENT PLANNED
LO-LIM	LOW CONTACT WITH OTHER USERS - LIMITED DEVELOPMENT PLANNED
LO-DEV	LOW CONTACT WITH OTHER USERS - EXTENSIVE DEVELOPMENT PLANNED
MOD-LIM	MODERATE CONTACT WITH OTHER USERS - LIMITED DEVELOPMENT PLANNED
MOD-DEV	MODERATE CONTACT WITH OTHER USERS - EXTENSIVE DEVELOPMENT PLANNED
MOD-STY	MODERATE CONTACT WITH OTHER USERS - STUDY POTENTIAL FOR FURTHER DEVELOPMENT
HI-LIM	HIGH CONTACT WITH OTHER USERS - LIMITED FURTHER DEVELOPMENT PLANNED
HI-DEV	HIGH CONTACT WITH OTHER USERS - EXTENSIVE FURTHER DEVELOPMENT PLANNED
VAR	VARIABLE

VISUAL MANAGEMENT

PRES	PRESERVATION VQO
RET	RETENTION VQO
PAR	PARTIAL RETENTION VQO
MOD	MODIFICATION VQO
MAX-MOD	MAXIMUM MODIFICATION VQO
VAR	VARIABLE VQO

FISH AND WILDLIFE MANAGEMENT

LIM	ENHANCEMENT OPPORTUNITIES LIMITED BY OTHER RESOURCE PRIORITIES
RES	ENHANCEMENT OPPORTUNITIES DETERMINED BY RESEARCH NEEDS
EAGLE	EAGLE HABITAT PROTECTED AND ENHANCED WHERE FEASIBLE
PROT	EXISTING SPECIAL HABITAT FEATURES PROTECTED
ENH	EXISTING SPECIAL HABITAT FEATURES ENHANCED
VAR	VARIABLE

VEGETATION MANAGEMENT

NAT	NATURAL VEGETATIVE PATTERNS MAINTAINED
RES	VEGETATIVE PATTERNS GOVERNED BY RESEARCH NEEDS
TIM	NATURAL VEGETATIVE PATTERNS ALTERED BY TIMBER HARVESTING
VAR	VARIABLE

TIMBER MANAGEMENT

NONE	NO TIMBER HARVESTING ALLOWED
UNREG	NO PROGRAMMED TIMBER HARVEST; UNREGULATED HARVEST MAY BE PERMITTED
RES	TIMBER HARVESTING GOVERNED BY RESEARCH NEEDS
HAR-5	TIMBER REGENERATION HARVESTS SCHEDULED AT A 5% RATE PER DECADE
HAR-7	TIMBER REGENERATION HARVESTS SCHEDULED AT A 7% RATE PER DECADE
HAR-10	TIMBER REGENERATION HARVESTS SCHEDULED AT A 10% RATE PER DECADE
HAR-12	TIMBER REGENERATION HARVESTS SCHEDULED AT A 12% RATE PER DECADE
FULL	TIMBER REGENERATION HARVESTS SCHEDULED AT AN EFFICIENT LEVEL SUBJECT TO MINIMUM MANAGEMENT REQUIREMENTS AND NONDECLINING YIELD (GENERALLY LESS THAN 30% PER DECADE)

ROAD MANAGEMENT

NONE	ROADS GENERALLY NOT PRESENT OR ALLOWED
RES	ROADS CONSTRUCTION/RECONSTRUCTION/MAINTENANCE/MANAGEMENT GOVERNED BY RESEARCH NEEDS
LIM-VIS	ROADS CONSTRUCTION/RECONSTRUCTION/MAINTENANCE/MANAGEMENT LIMITED BY VISUAL OBJECTIVES
LIM-REC	ROADS CONSTRUCTION/RECONSTRUCTION/MAINTENANCE/MANAGEMENT LIMITED BY RECREATIONAL OBJECTIVES
LIM-WLD	ROADS CONSTRUCTION/RECONSTRUCTION/MAINTENANCE/MANAGEMENT LIMITED BY WILDLIFE OBJECTIVES
EFF	ROADS CONSTRUCTION/RECONSTRUCTION/MAINTENANCE/MANAGEMENT BASED LARGELY ON COST EFFICIENCY
VAR	VARIABLE

FORPLAN CODE

00	No programmed timber harvest (nontimbered, Unsuitable, withdrawn, etc.)
55	5% of the area available for final harvest in any 10-year period.
77	7% of the area available for final harvest in any 10-year period.
10	10% of the area available for final harvest in any 10-year period.
12	12% of the area available for final harvest in any 10-year period.
TI	General Forest (Greater than 12% available for final harvest in any period).
PD	Nonnational forest.

The process of developing the management prescriptions began with a review of the issues, concerns, and opportunities, which led to the development of prescription options with related goals and objective statements. The IDT used research literature and professional judgement to identify projects which would be consistent with existing policy, legislative direction and the identified goals.

In addition to addressing ICOs, the process of designing management prescriptions was also guided by the following criteria: (1) prescriptions should be achievable and contain realistic practices, (2) they are to be general enough to accommodate the variable site specific conditions on the ground, (3) they should be specific enough for the IDT to develop accurate resource and economic output and effect coefficients, and (4) to the extent practicable, they should be the most cost effective means of achieving the intent of the prescription.

To a large degree the particular structure used represented a consensus judgement about the type and detail of direction appropriate for management areas. Sufficient detail is necessary to resolve problem areas and provide clear direction. Enough flexibility must be preserved to allow for efficient accomplishment of objectives. Improvement of the accuracy and specificity of data and of analysis techniques may allow more specific direction in the future.

Management practices are implemented within each prescription according to the resource management goals of the prescription and the standards and guidelines. A map of the land allocation for each management area is available for each alternative. This map, in conjunction with the associated prescriptions, and the standards and guidelines identifies where activities will take place during the implementation of any one alternative. Table B-5 compares the major standards and guidelines for each management prescription. The goals of each management prescription are summarized below. Chapter IV of the Forest Plan describes them more completely.

Timber Options

FORPLAN prescriptions are combinations of scheduled activities and practices, and their associated outputs and effects. These prescriptions and their range of timing choices are represented as decision variables in FORPLAN. The outputs and effects associated with the prescription choices are calculated for each decision variable.

FORPLAN prescriptions are represented at three levels within FORPLAN. At the first level, a set of management emphases parallel the management prescriptions discussed in the previous section. Within many management emphases a set of management intensities are represented as choices in the FORPLAN model. These intensities depict different combinations of activities such as timber harvesting, planting, commercial thinning, etc. At the third level, dozens of different timing patterns and rotation ages were provided for most management emphasis and management intensity combinations on timbered lands.

A wide range of yield tables that encompassed all practicable combinations of management practices was developed. The dynamic programming option used with the DP-DFSIM model for Douglas fir types greatly aided this process by automatically selecting the optimum timing and level of activities for a given set of criteria. A set of yield tables was then selected for further analysis in FORPLAN. Decisions made based on this FORPLAN analysis resulted is a final set of management intensities and timing choices used as FORPLAN prescriptions. The actual FORPLAN intensities and timing choices for each analysis area are listed in the FORPLAN data sets (part of the Forest Planning Records).

Management intensities developed with DP-DFSIM involved different mixes of reforestation methods, precommercial thinning, fertilization timing, and commercial thin timing. Each combination of activities tested were developed under both a maximum timber volume (MAI) objective function and a maximum PNV objective function. Table B-6 and Table B-7 display the results of these yield tables for Douglas fir/western hemlock and Douglas fir/true fir respectively. More intensive analysis was performed with the Douglas fir/western hemlock timber type than with other types since it occupies over 80% of the suited timber land.

For the true fir and mountain hemlock timber types management intensities were developed with the PROGNOSIS model, involving different mixes of reforestation methods, precommercial thinning, and commercial thinning. Table B-8 and Table B-9 display the results of these yield tables for the true fir and mountain hemlock types respectively.

The number of yield tables used in FORPLAN for the Douglas fir strata was reduced by using DP-DFSIM to analyze all the possible treatment combinations for each objective (maximize volume or present net value). Only the optimum regime for each management intensity was used in FORPLAN. Based on public comment, a prescription that called for one heavy commercial thinning (and consequently led to earlier culmination of mean annual increment and a 60-year rotation) was added to the FEIS analysis. The prescription was chosen by FORPLAN even though it produced a lower mean annual increment and a lower present net value. Both the heavy thinning and the shorter rotation age were valued by FORPLAN for their ability to fill in the harvest schedule during the fifth through seventh decades.

For the true fir and mountain hemlock strata, a range of managed yield tables with various treatment options was developed from the base tables, using PROGNOSIS to determine volumes. Because PROGNOSIS is not an optimization program like DP-DFSIM, many more runs were necessary to determine the optimum regimes. A program called "CHEAPO" was used in conjunction with PROGNOSIS to calculate PNVs and to determine the regimes which would maximize PNV for each management intensity.

Since management options are comparatively few for existing stands, all distinct options were included in the model. Model size considerations prohibited inclusion of all management intensities developed for managed stands. Management intensities were selected based upon economic efficiency, timber volume contributions, silvicultural considerations, and operational practicalities. Tables B-6, B-7, B-8, and B-9 also display which of the following criteria were used to eliminate particular management intensities:

- No precommercial thinning (1);
- Commercial thins were not economically practicable (2);
- Ten-year commercial thinning intervals (3);
- Silvicultural considerations (4);
- Lower PNV (5).

Table B-6. Management Intensities for Douglas Fir/Western Hemlock

								95% CMAI Rotation			CMAI Rotation			
Management Intensity Number	Thin Cycle	Thin Economics	Objective Function	Method of Reforestation	PCT Age	FERT Age	CT Age	Age	MAI	PNV	Age	MAI	PNV	Elimination Criteria
1	N/A	N/A	MAX TIM	Artificial	--	--	--	66	108	$-386	86	111	$-312	1
2	Uncon-strained	Thins Must Pay	MAX TIM	Artificial	--	--	66/86	86	115	$-225	96	122	$-238	1
3	N/A	N/A	MAX TIM	Existing Poles	--	--	62	102	96	$2620	142	99	$1272	
4	N/A	N/A	MAX TIM	Existing Poles	--	63	62	102	99	$2627	142	102	$1243	
5	N/A	N/A	MAX TIM	Artificial	12	--	--	67	133	$-162	77	136	$-227	
6	N/A	N/A	MAX TIM	Artificial	12	24	--	57	139	$-292	67	146	$-151	
7 [1]	20 year	Thins Must Pay	MAX TIM	Artificial	12	--	57/77	--	--	--	107	148	--	4
8	20 year	Thins Must Pay	MAX TIM	Artificial	12	--	47/67	77	142	$-133	107	147	$-249	
9	Uncon-strained	Uncon-strained	MAX TIM	Artificial	12	--	27/37/47 /77/87	77	149	$-369	107	154	$-454	2, 3
10	20 Year	Thins Must Pay	MAX TIM	Artificial	12	30	47/67	77	154	$-106	107	157	$-205	
11	Uncon-strained	Uncon-strained	MAX TIM	Artificial	12	30	27/57/67	67	157	$-364	87	165	$-367	2, 3
12	Uncon-strained	Thins Must Pay	MAX TIM	Artificial	12	30	47/67/77	77	156	$-120	97	159	$-222	3
13	20 Year	Uncon-strained	MAX TIM	Artificial	12	30	37/57	67	153	$-220	87	161	$-287	2
14	N/A	N/A	MAX PNV	Natural	--	--	--	64	93	$-150	94	98	$-53	1, 5
15	N/A	N/A	MAX PNV	Artificial	--	--	--	66	108	$-386	86	111	$-312	1, 5

Table B-6. Management Intensities for Douglas Fir/Western Hemlock

								95% CMAI Rotation			CMAI Rotation			
Management Intensity Number	Thin Cycle	Thin Economics	Objective Function	Method of Reforestation	PCT Age	FERT Age	CT Age	Age	MAI	PNV	Age	MAI	PNV	Elimination Criteria
16	N/A	N/A	MAX PNV	Natural	14	--	--	65	116	$-100	85	119	$- 26	
17	N/A	N/A	MAX PNV	Artificial	12	--	--	67	133	$-162	77	136	$-227	5
18	N/A	N/A	MAX PNV	Natural	14	24	--	65	127	$+ 41	75	128	$+ 40	
19	N/A	N/A	MAX PNV	Artificial	12	24	--	57	139	$-292	67	146	$-151	5
20	20 Year	Thins Must Pay	MAX PNV	Natural	14	--	45/65	85	123	$+ 65	125	128	$- 52	
21	20 Year	Thins Must Pay	MAX PNV	Artificial	12	--	57/77	77	139	$-174	107	143	$-137	4, 5
22	20 Year	Thins Must Pay	MAX PNV	Artificial	12	--	47/67	87	140	$- 74	127	144	$-234	5
23	Uncon-strained	Uncon-strained	MAX PNV	Natural	14	--	55/75	75	123	$+ 24	115	128	$+ 26	2, 3
24	Uncon-strained	Uncon-strained	MAX PNV	Artificial	12	--	47/67/77	77	136	$- 67	127	141	$-176	2, 3, 5
25	20 Year	Thins Must Pay	MAX PNV	Natural	14	24	45/65	75	131	$+134	125	138	$- 18	
26	20 Year	Thins Must Pay	MAX PNV	Artificial	12	30	47/67	67	146	$- 95	117	154	$-195	5
27	Uncon-strained	Uncon-strained	MAX PNV	Natural	14	24	55/65	65	130	$+ 79	115	137	$+ 32	2, 3
28	Uncon-strained	Uncon-strained	MAX PNV	Artificial	12	30	47/57/67	67	146	$-134	117	152	$-141	2, 3, 5
29	Uncon-strained	Thins Must Pay	MAX PNV	Natural	14	24	55/65	65	130	$+ 79	115	137	$+ 32	3
30	20 Year	Uncon-strained	MAX PNV	Natural	14	24	55/75	75	137	$+ 97	105	140	$+ 65	2

[1] Most results were not calculated since the relative density exceeded 60 prior to thinning.

Table B-7. Management Intensities for Douglas Fir/True Fir

							95% CMAI Rotation			CMAI Rotation			
Management Intensity Number	Thin Cycle	Thin Economics	Objective Function	Method of Reforesta-tion	PCT Age	CT Age	Age	MAI	PNV	Age	MAI	PNV	Elimination Criteria
1	N/A	N/A	MAX TIM	Artificial	--	--	86	87	-- [1]	106	90	$-362	2, 3, 1
2	Uncon-strained	Thins Must Pay	MAX TIM	Artificial	--	76/86	96	94	$-360	116	99	$-358	1
3	N/A	N/A	MAX TIM	Artificial	15	--	77	106	$-397	87	109	$-355	
4[2]	20 Year	Thins Must Pay	MAX TIM	Artificial	15	67/87	--	--	--	107	125	--	4
5	20 Year	Thins Must Pay	MAX TIM	Artificial	15	57/77	97	119	$-298	117	123	$-348	
6	Uncon-strained	Uncon-strained	MAX TIM	Artificial	15	37/57/77	97	123	$-489	107	128	$-497	2, 3
7	N/A	N/A	MAX PNV	Natural	--	--	84	76	$-157	114	79	$-116	1, 5
8	N/A	N/A	MAX PNV	Artificial	--	--	86	87	-- [1]	106	90	$-362	1, 5
9	N/A	N/A	MAX PNV	Natural	17	--	75	93	$-164	95	96	$-112	
10	N/A	N/A	MAX PNV	Artificial	15	--	77	106	$-397	87	109	$-355	5
11	20 Year	Thins Must Pay	MAX PNV	Natural	17	55/75	105	105	$- 59	115	107	$- 83	
12	20 Year	Thins Must Pay	MAX PNV	Artificial	15	57/77	97	115	$-228	117	120	$-281	5
13	Uncon-strained	Uncon-strained	MAX PNV	Natural	17	65/75/85	95	100	$- 41	115	105	$- 70	2, 3
14	Uncon-strained	Uncon-strained	MAX PNV	Artificial	15	57/87	97	116	$-227	117	121	$-273	2, 3, 5

[1] PNV not calculated since the final harvest did not pay.

[2] Most results not calculated since the relative density exceeded 60 prior to thinning.

Table B-8. Management Intensities for True Fir

					95% CMAI Rotation			CMAI Rotation			
Management Intensity Number	Method of Reforestation	PCT Age	FERT Age	CT Age	Age	MAI	PNV	Age	MAI	PNV	Elimination Criteria
1	Natural	--	--	--	135	62.9	$-176	175	66.0	$-181	1
2	Artificial	--	--	--	77	87.2	$-413	97	90.6	$-396	1
3	Natural	--	--	95	125	66.5	$-173	155	69.4	$-177	1
4	Artificial	--	--	67	87	92.1	$-390	107	94.0	$-377	1
5	Natural	15	--	--	75	81.3	$-196	95	84.5	$-178	
6	Artificial	15	--	--	77	91.5	$-418	87	93.9	$-401	
7	Natural	15	--	65	85	85.4	$-175	95	86.9	$-188	
8	Artificial	15	--	67	87	95.8	$-389	97	97.9	$-386	

Table B-9. Management Intensities for Mountain Hemlock

					95% CMAI Rotation			CMAI Rotation			
Management Intensity Number	Method of Reforestation	PCT Age	FERT Age	CT Age	Age	MAI	PNV	Age	MAI	PNV	Elimination Criteria
1	Natural	--	--	--	105	46.4	$-183	125	48.3	$-171	1
2	Artificial	--	--	--	67	69.4	-- [1]	97	70.4	$-370	1
3	Natural	--	--	105	125	51.9	$-173	165	54.1	$-181	1
4	Artificial	--	--	77	87	74.3	$-367	97	75.7	$-375	1
5	Natural	15	--	--	75	66.7	$-152	85	68.5	$-165	
6	Artificial	15	--	--	77	75.9	$-381	87	77.4	$-397	
7	Natural	15	--	75	85	69.6	$-176	95	70.9	$-185	
8	Artificial	15	--	77	87	78.8	$-403	97	80.0	$-417	

[1] PNV not calculated since the final harvest did not pay.

Those intensities without precommercial thinning were eliminated since they were inferior both in terms of PNV and in timber volume when compared to intensities with precommercial thinning. Intensities where revenues returned from the timber volume sold were insufficient to cover expenditures were also eliminated. This occurred primarily with commercial thinnings and had the effect of forcing commercial thinnings to occur later in the rotation for the intensities retained. The third criterion was based on District experience with laying out and administering timber sale contracts for commercial thinning. The extremely large number of acres to be thinned when thinnings are scheduled every 10 years was considered to be operationally unworkable. The Forest cannot legally operate two sales in the same area at the same time. The effect of dropping intensities with 10-year thinning intervals was to have fewer thinnings with the remaining intensities. A fourth criterion, silvicultural considerations, resulted in the elimination of a few yield tables due to the scheduling of commercial thinnings after stand relative density exceeded a value of 60. Forest silviculturists felt that the DP-DFSIM model projected an unrealistic growth pattern after commercial thinning stands with relative densities greater than 60. A final criterion resulted in the elimination of management intensities with a low PNV if similar intensities were available with a higher PNV. Those management intensities without any elimination criteria listed were carried forward into the next analysis step.

Potential effects due to use of these screening criteria can be estimated by comparing two tables that are identical except for the parameter of interest. For example, to estimate the volume loss of criterion 3, ten-year thinning intervals, under a maximum timber objective, for Douglas fir/western hemlock, compare intensities 10 and 12 from Table B-6. In the MAI column under CMAI rotation the difference between 157 and 159 indicates a 2 cubic feet/acre/year potential effect.

A final set of analyses were performed examining the use of natural regeneration versus planting, the competitiveness of non-timber prescriptions with timber prescriptions in terms of PNV, and the types of timing choices to provide FORPLAN. These analyses were combinations of both FORPLAN and non-FORPLAN analysis.

Since the per acre stand level analysis in DP-DFSIM consistently showed natural regeneration to be more economically efficient than planting, intensive analysis of this question was done. To achieve the biological conditions for successful natural regeneration, a seed source is needed. This is accomplished by using a two-stage removal process on the stand to be harvested. The trees left after the first entry provide the seed source for stand establishment. The second entry removes the seed source after stand establishment occurs and completes the harvest operation.

Since there is a period of about five years between the two entries, a reduction in PNV for the existing stand occurs. The net revenues associated with the second entry are delayed and the effects of discounting make them worth less in today's dollars. In the analysis displayed in Table B-10, the reduction in PNV on the existing stand more than offset the PNV gain on the managed stand for the natural regeneration prescription. These results indicate that if natural regeneration is selected when either method would accomplish the reforestation objective, a loss in total PNV would result.

Table B-10. Analysis Results

Rx/Stand	Existing Stand	Future Managed Stand	Total
Plant	11,210	-284	10,926
Natural Regeneration	10,251	-132	10,119
Difference	959	-152	807

Additional analysis of this issue was also conducted with FORPLAN. Two runs that used the maximize PNV objective function were compared. The only difference between the two runs was that one allowed natural regeneration prescriptions to be considered in addition to planting, and one did not. Only 393 acres of natural regeneration came into solution on the run where this option was available. This result could be due to the factors described in the previous paragraphs, or to the ability of FORPLAN to harvest more high valued existing timber by bringing into solution planting intensities with higher future volumes.

A preliminary analysis of other resource prescriptions was conducted outside of FORPLAN to determine if they could compete with timber on a per acre basis. Dispersed recreation and scenic resource prescriptions were analyzed and compared to timber prescriptions. This analysis showed that when an existing stand of mature timber is present, other resource prescriptions with their higher costs, could not compete despite higher recreation values. If an existing stand could not be harvested immediately, the higher recreation values enabled a number of these other resource prescriptions to be economically competitive. To determine if this would still hold true on a Forest-wide basis when future stand growth considerations enter into the analysis, a FORPLAN run was made which included the most competitive of the other resource prescriptions. Approximately 920 acres went to a scenic prescription in this run. Since this represented less than 0.1 percent of the suitable timber acres, non-timber prescriptions were dropped from further consideration when PNV was the sole objective.

Finally a *Stage II* (discounted present net value per acre) financial analysis was completed. The results showed that values per acre were dependent upon timber type, volumes per acre, logging cost class (average logging cost in a watershed), and projected growth rates. Present net values range from over $11,000 per acre for Douglas-fir stands on flat ground, to almost zero for many mountain hemlock/ Lodgepole stands on steep ground. Timber harvests in areas where positive financial returns are questionable will be carefully reviewed.

Development of Yield Coefficients

Timber Yield Coefficients

Timber yield tables for the Willamette were developed for three separate components; i.e., empirical yield tables for existing mature stands, managed yield tables for plantations and future stands, and merchantable material available but not regulated, such as salvage. Each of these three components will be discussed in this section. Processes for constructing empirical yield tables and for building tables for the unregulated volume were relatively simple. More intensive effort was expended on development of the managed tables. The "Timber Yield Tables" process record contains further details (1920 12/31/84).

The empirical yield tables were generated from information obtained from the Willamette National Forest Timber Inventory by the Regional Office. The timber inventory information was compiled by

timber type and size class stratum. The existing stand volume per acre was determined. The rate of growth on the growing stock was also determined. Curves were constructed for both the projected stand volume and the projected growth. These curves were then combined to create a controlled volume curve that predicts future volume for each stratum. Empirical yield tables were then tabulated from this curve (USDA Forest Service, R-6).

Between the DEIS and FEIS, new defect and breakage (D&B) values were calculated for the empirical yield tables, to more accurately reflect the variation by species and size class. Cruise data from a sample of timber sales across all Ranger Districts was used to determine the percent D&B for poles, small sawtimber, large sawtimber and old growth for each of the model components. A reduction in breakage was applied to large sawtimber and old growth stands, based on uphill falling studies on slopes of 30% or greater. The yield tables have also been updated for growth to 1994.

The Douglas fir Simulator (DFSIM), a growth and yield model, was used to simulate a wide variety of growth and harvest patterns over time for the Douglas fir and Douglas fir/true fir managed yield tables (Curtis, 1981). With DFSIM the user can simulate yield regimes for Douglas fir under different regeneration options (planted or natural) with or without precommercial thinning (PCT) and with or without fertilization. For a given set of investments, the goal was to find the combination of intermediate harvest and final harvest that best met the objective of maximizing volume or present net value (PNV). To search for the combination of thinnings and final harvest over different rotation ages that best met the objective and constraint set would require a great number of DFSIM runs.

Dynamic programming in conjunction with DFSIM (DP-DFSIM) is a computer program that automates the search for yield regimes in DFSIM that optimizes either volume or PNVs, and does so in a computationally efficient manner (Johnson 1984).

Yield tables were developed to represent each objective for a range of management intensities from "natural regeneration with no intermediate treatments" to "planting genetically improved stock with full stocking level control plus fertilization."

Three major operational constraints affecting commercial thinning entries were placed in the DP-DFSIM program for the yield tables eventually selected for use in FORPLAN. Commercial thinning entries had to be spaced at least 20 years apart, had to break even economically, and had to be scheduled before the relative density reached 61 when called for after PCT. Relative density (RD) expresses the average level of competition in a given stand, relative to a stand of maximum density. Numerical values range from 0 to 100. Relative density was constrained because DP-DFSIM ignores the effect of high initial RDs on the growth of trees after thinning. Some of the optimal regimes allowed the RD to exceed 60 and still showed normal response to thinning. To avoid this, any regime which showed a RD of 61 or greater prior to a commercial thin (if PCT'd) was dropped from consideration (2410 Plans, May 22, 1984). Without PCT, the stand exceeds 60 RD before reaching commercial thinning size.

The above constraints generally resulted in commercial thinning regimes that were similar to what empirical appraisals had indicated were necessary. The average stand diameter at the first commercial thin is about 12 inches, and the per acre volume removed is 4,000+ board feet depending on the logging system. A ground-based system with lower logging costs requires less volume to break even than a skyline system. It must be emphasized that these figures are averages for the entire Forest, and individual stand prescriptions by certified silviculturists will vary depending on site-specific conditions.

The different logging system costs produced some minor differences in yield tables due to the amount of commercial thin volume needed to break even. If the objective is to maximize volume, an unconstrained DP-DFSIM run shows numerous light thins starting at age 27 with as little as 200 board feet per acre removed to be best. With operational constraints, the lower costs for ground logging means lighter

thins are possible and produced slightly higher volumes over the rotation than skyline systems. Aerial logging costs were too high to allow commercial thinning to break even.

Separate yield tables were developed for ground and skyline logging systems. However, the differences were minor, the greatest being 3 cubic feet mean annual increment (MAI). The Forest area designated suitable for ground logging includes high-lead cable systems which cannot be used for commercial thinning. These areas (90% of the ground logging area) will have to be skyline thinned, and, therefore, would fit the skyline yield tables. Because of these considerations, only the skyline yield tables were used.

For the objective of maximizing PNV, the best regime is to thin heavy as soon as possible to generate revenue and offset the earlier investments. In this case, skyline and ground logging systems thinned the same amounts. Only the PNV was different due to the different logging costs. Again, only one yield table was necessary. FORPLAN applied the appropriate costs for each logging system at the time of final harvest.

A major consideration was the precommercial thinning level and the effect it would have if commercial thinning was delayed until the stand averaged about 12 inches d.b.h. (Reukema 1979). The precommercial thinning level was set at 300 trees per acre in the Douglas fir/hemlock, Douglas fir/true fir, and true fir types and 400 trees per acre in the mountain hemlock stratum. Three hundred trees were picked in the DFSIM model because this was the bottom limit of data, and the model operation is such that it never reaches a point where growth does not respond to lower stocking and taper off. Bob Curtis, the Douglas fir simulator model developer (DFSIM), does not recommend modeling precommercial thinnings below 300 trees per acre. Thinning below 400 trees per acre in the PROGNOSIS model caused volume losses. However, when 400 trees per acre was used in the true fir stratum, a large jump in mortality was observed before commercial thinning, and the RD approached 65. This indicated undesirable overstocking. Reducing stocking to 300 trees solved the problem with little loss in MAI. The mountain hemlock stratum did not show the large jump in mortality when age 30 stocking was set at 400 trees per acre.

The optimum precommercial thinning age is 12 years for the Douglas fir/hemlock stratum and 15 years for the other strata. Actual precommercial thinning within that range is not very sensitive. For natural regeneration, PCT was not scheduled until stand age is 14. This additional time to PCT is due to the difference in height growth between planting a 2-0 seedling and a natural germinant. Calculation of the net MAI is based on the age of the stand plus the time between harvest and planting (regeneration lag). Using Forest-wide information stored in the TRI systems, the average time between sale closure and planting was found to be 1.9 years for the period 1978 to 1980. This was considered the most recent data available for normal operations. The actual period of bare land condition would be somewhat longer depending on the amount of time between harvest and sale closure. Based on this, a 3-year regeneration lag between the time trees are severed from the stump and the unit is adequately restocked was considered most accurate. For natural regeneration, 2 years was added for a total regeneration lag of 5 years. This is due to the inconsistency of seed production from year to year.

The DFSIM model is based on data from actual stands. However, very little information was included on stands over 80 years old. Growth and yield outputs for ages 80 to 100 are considered plausible extrapolations. The program contains a warning that stand statistics beyond 100 years are gross extrapolations of the model.

Yield information was also needed for longer rotations beyond age 100, for wildlife, visuals, riparian management, and dispersed recreation.

It was decided to use the empirical yield tables growth for longer rotations and to gradually change from managed to empirical tables over a five-decade period. This provides a smooth transition between tables and a gradual slowdown of growth.

The time at which the shift begins is age 100 or the age at CMAI on the DP-DFSIM run, whichever is greater. A few regimes culminated a little beyond age 100. DP-DFSIM often shows a different regime is better for longer rotations, so no information would be available beyond CMAI. For these situations, DFSIM runs were matched to the DP-DFSIM regime and the rotation extended five decades beyond age 100 or CMAI, in order to provide the necessary information for the shift to the empirical tables. The point at which the empirical table is entered is where the basal area most closely matches the managed basal area at age 100 or CMAI.

The DFSIM model was generally believed to be inappropriate for the true fir and mountain hemlock strata. The data base does not include stands growing under these ecological conditions. By their classification, Douglas fir can only be a minor component. Observations and plot data show that although height growth may not be as good as that of trees growing in lower elevations, the sites can support good diameter growth, and that growth can be maintained for long periods of time (Hegyi 1981). In the DFSIM model, stands with low site index appear to be concentrated on warmer sites with low productivity.

The PROGNOSIS model, developed in Northern Idaho by Stage (Wykoff 1982), was examined and then chosen as the model to develop yield tables in these upper elevation strata. The model was chosen because:

- The ecological types of the silver fir zone closely resemble conditions in Northern Idaho where the model was developed,
- The model was developed for mixed true fir stands,
- There is a strong white pine data base and white pine is becoming a more important tree in these elevations,
- The model can handle a mixture of age classes,
- The model provided great flexibility for local calibration. Therefore, of all outside models, it looked like the most adaptable,
- It had excellent support in Region 1, and they were willing to help adapt it to Willamette National Forest conditions.

The PROGNOSIS model was adapted and calibrated as follows:

- Species were grouped to conform to species in the model. Noble fir, white fir and grand fir were grouped under grand fir. All cedars were grouped under western redcedar. Silver fir and subalpine fir were grouped under subalpine fir.

- Instead of using site index to calibrate growth, the model uses habitat type. After consultation with Miles Hemstrom, the Area Ecologist, the subalpine fir/beargrass habitat type was chosen as a broad representative habitat type for model building.

- The model requires that a Forest aspect and slope be input (Wykoff, 1982). Parameters chosen were the Clearwater Forest, an aspect of northwest and a slope of 5%. Most of the true fir zone lies in the New Cascades where the slopes are fairly level and the aspects west facing.

- The model has a diameter growth calibration feature in which actual plot growth is used to modify the internal growth equations. All inventory plots in the true fir and mountain hemlock strata were run for one 10-year cycle in the model to find the calibration factors for each species. Multiple linear regression analyses were then run to determine if there were trends that could be found to recalibrate the diameter growth functions.

- Most relationships were weakly correlated, although the regression line was significant. Data for Douglas-fir in both the true fir and mountain hemlock strata were combined to increase accuracy. Noble fir had to be similarly combined.

- Height growth had to be modified to fit Willamette National Forest conditions. The shape of the curves generated by the model was compared with growth curves developed for ecology plots and published curves for west coast conditions and species (Herman 1978). Height growth modifiers were then applied to force the model to follow the shape of the local curves.

  Model projections started at stand age 30, the estimated time it would take the stand to reach approximately 5 inches d.b.h. Five inches was chosen because this is the point the PROGNOSIS model switches from the small tree to the large tree growth model. Individual species diameters at age 30 for the mountain hemlock and true fir strata were calculated from increment cores taken on ecology plots in the silver fir zone. Only cores were used that showed little or no signs of early suppression. Not enough white pine was sampled in mountain hemlock types for a good diameter estimate for that stratum. The diameter was estimated by using the difference in diameter for noble fir between the mountain hemlock and the true fir stratum, and Englemann spruce had too small a base in the mountain hemlock stratum. Therefore, the same approximate starting diameters were used for these species in both strata.

- Mortality estimates are the weakest part of most models. The embedded mortality estimates in the model are from northern Idaho. The estimates appear too high when compared to local conditions. Two checks were made of the mortality rates. First, rates in the model were compared with rates experienced for Douglas-fir at Wind River in the 50-year old stocking study (Reukema 1979). Mortality rates for similar stocking densities were only 54% as large as the model rates. At first, an adjustment was made to the model to reduce the mortality to Wind River rates until age 50. Then an adjustment was made to use the model rates after that. Two problems developed: (1) for runs made with no commercial thinning, a too rapid buildup of the basal area (BA) was experienced; (2) when commercial thinning was done, recovery of the BA appeared too slow.

  The top end of the BA is limited by the BA function of the model. The model limits the BA by increasing mortality rates to reduce stocking. For the true fir stratum, maximum basal area was set at 367 square feet. This is one standard deviation above the average BA for the stratum. For the mountain hemlock stratum, the average inventory BA of 243 square feet was set as the maximum. The average was used for the mountain hemlock stratum because it was felt that the environmental conditions are such that sustaining basal areas much over our in-place average will not be possible.

  The maximum BA function did not entirely solve the problem of a too rapid rise of BA in the 50 to 120-year age range. BA projections from sample model runs were compared with published normal yield tables. The model was reprogrammed so that the maximum BA for each age class was then limited to those published values. Grand fir tables developed by Cochran (1979) were used for the first 100 years, and tables developed for white pine by Haig (1932) were used for older stands. Site index 60, age 50 base, was used for the true fir stratum; and site index 50 was used for the mountain hemlock stratum. This was based on curves developed from site index data on inventory plots.

The problem still remained of the model mortality rates reducing stocking faster than growth could recover. In order for the model to be able to grow trees approximately along the normal curve, mortality rates were reduced to 0.75 of model estimates for the true fir stratum and 0.8 for the mountain hemlock stratum.

- An economic analysis was used to determine the diameter of the first commercial thinning. This occurred at the start of decade seven after harvest for both true fir and mountain hemlock strata. The residual commercial thinning level was first estimated using the default values in the model. The model residual thinning basal area was 45% of normal tree numbers as determined from Haig's normal yield tables for second growth white pine.

  This was rounded down to the nearest 10 square feet. This produced residual basal areas of between 190 and 200 square feet. That appeared too high. Mortality rates continued at high levels. Other smaller residual basal areas were tried and 170 square feet was settled upon. This produced a residual relative density of about 42 after thinning.

- Precommercial thinning levels were chosen so that relative density would not be over 63 at the time of the first commercial thinning. The rationale for this upper limit was the same as in the Douglas fir/hemlock and Douglas fir/true fir strata, except a higher limit was set because of the greater tolerance of the trees. For the true fir strata, trees were precommercially thinned to 300 trees per acre; while the mountain hemlock strata was thinned to 400 trees per acre.

For all the yield tables developed from both DFSIM and PROGNOSIS it was necessary to develop adjustments to convert from gross volume per acre to net volume and to allow for volume falldown resulting from natural and manmade conditions. There are two types of adjustments: 1) an acreage adjustment which reflects land areas too small to be deleted from the suitable timbered land base, but which are unsuited for timber management (understocked plantations, nonstockable areas in plantations due to poor site, soil compaction, root rot, etc.); or 2) a yield adjustment which reflects changes due to defect and breakage, fertilization, and genetics.

The adjustments:

- A percentage reduction for plantations with stocking that meets legal minimum, but is low enough to reduce full yield.

- A reduction for unstocked areas within plantations resulting from poor site conditions, disease, soil compaction or loss, competing vegetation, and future catastrophic losses due to fire, wind, insects, etc.

- A reduction for defect and breakage which shows up at time of harvest. This would vary with age and size.

- An increase for genetics.

- An increase for fertilization.

- Wildlife trees.

- Future road construction.

The rationale behind the adjustment percentages is described in the following paragraphs:

- *Understocked Plantations* - A total of 5,244 plantations on the Willamette National Forest were analyzed for stocking. It was found that a significant number of these plantations were poorly stocked. Poor stocking will have an effect on the final harvest production.

  The percentage of understocked acres was determined for each species stratification. These percentage relationships are 2% for Douglas fir/ hemlock, 6% for Douglas fir/true fir, 6% for true fir, and 3% for mountain hemlock. It was assumed that the main falldown in volume will be uncaptured commercial thinning volume. The amount of commercial thinning volume was adjusted by the poor stocking percentages to obtain a factor to be applied to the yield tables. These factors are 0.5% for Douglas fir/hemlock, 1.0% for Douglas fir/true fir, 1.0% for true fir, and 0.5% for mountain hemlock.

- *Unstocked Holes in Plantations and Future Catastrophic Losses* - The above factors account for entire plantations that are understocked. Many other plantations contain localized unstocked areas due to unsuited soils, soil compaction or loss (landings, skid roads, etc.), competing vegetation, disease (primarily root rot pockets), etc. Information on holes in the plantations was obtained from the Districts. Each District submitted a list of plantations (representing a 10% sample of previous 3 years data) showing an estimate of unstocked and nonstockable areas within each plantation. These estimates were weighted by acreage sampled per District for each strata to obtain Forest averages. This resulted in an adjustment of 7% to the Douglas-fir/ hemlock and Douglas-fir/true fir strata and 8% to the true fir stratum. There were no samples of the mountain hemlock stratum. It was decided to use 8% in the mountain hemlock stratum also.

  There is little information on the effect on this Forest of insects and wind in managed stands. Future losses are assumed to be negligible. Past fire history was used to determine what losses could be expected in the future. The amount of land burned has decreased from 1,000 acres/year over the last 30 years to 300 acres/year over the last 10 years. Volume loss due to fire will probably continue to decline as detection and preventive methods improve and access increases. This loss should be well below 0.5%. Overall, the Forest should not experience major losses, and any volume reduction will be assumed to be included in the above deductions. Actual catastrophic losses would be dealt with by a plan revision.

- *Defect and Breakage* - The defect and breakage figures for managed stands are the same ones used in the current Land Use Plan. These figures were obtained from a 2470 memo to the files dated December 22, 1975. The deductions in the memo were broken down into more age groups than the present strata. Deductions were picked as close to the median as possible for each timber size grouping.

- *Genetics* - Theisen (1980) summarized expected gains from genetic tree improvement programs. The Forest's adjustments were based upon those recommendations.

  The Forest is just getting into seed orchard management. At the present time, it is difficult to predict when seed orchards will become available in significant amounts. Therefore, only the gain attributed to seed collected from select trees was included in the yield tables.

  A blanket gain of 10% for planting stock grown from select tree seed was added to all the yield tables that apply to plantations planted from the beginning of the new Forest Plan and beyond. No genetic gains will be assumed for plantations established before the beginning of the new plan. Select trees have been identified in all strata.

- *Fertilization* - In order to gain some consistency in the absence of statistically significant data for individual Forests, the Regional Office directed the westside Forests to use the DP-DFSIM model to determine response to fertilizer (2410, April 12, 1984). The Region also directed that fertilizer could be applied once to all stands containing at least 60% Douglas fir. These stands make up the Douglas fir/hemlock model component. An application rate of 200 pounds/acre is generally the most cost effective and was used in DP-DFSIM. The DP-DFSIM model was used to determine the optimal stand age for application without resulting in a relative density of 60 or more before the first commercial thinning. The application of fertilizer resulted in a 15% increase in mean annual increment after 7 years and an overall increase in CMAI of 8% for full stocking level control (FSLC) with genetics.

- *Wildlife Trees* - To meet wildlife tree requirements over time, it is necessary to leave green replacement trees that can be used when the existing trees no longer provide habitat. Wildlife trees were cruised on a number of timber sales across the Forest to determine volume reductions for the yield tables. Each of the green trees represents about 2% of the net volume per acre. Depending on the existing condition of a watershed, the FORPLAN model will leave enough trees to maintain at least 0.8 wildlife trees per acre and make the appropriate reduction in the yield tables. There is also a factor to account for the effect of the trees on the growth of the understory.

In addition to the empirical and managed timber yield components a third timber yield component includes volume not reflected in the empirical and managed yield tables. This volume includes "salvable dead" (salvage from harvest units), "chargeable dead salvage" (salvage found throughout the Forest), "nonchargeable cull" (unsound material used as chips, etc.), "unregulated" (nonscheduled volume such as from the Experimental Forest), and "nonchargeable miscellaneous convertible products" (shakes, posts, firewood, etc.). These components were all separately calculated and included in the total "Timber Sale Program Quantity."

An analysis of sell and harvest records was done to obtain an assumed average percentage increase to the decade timber harvest for chargeable dead salvage, nonchargeable cull volume, unregulated volume, and miscellaneous convertible products.

The Cut and Sold Reports were used to obtain the average annual sold volume (both sound and cull) from 1977 to 1982. The average sound volume was then used as the base green volume to be used in calculation of percentage increases for cull, salvage, and other miscellaneous volumes.

The Cut and Sold Reports provided the nonchargeable cull volume and the other convertible products, such as posts, shake bolts, etc.

The Timber Inventory Adjustment Record for fiscal years 1980 through 1982 provided the sound, salvable dead, and the unregulated volume from land not allocated for timber production.

The volume adjustments thus calculated are shown below:

Type of Volume	Percent Increase
Chargeable Dead Salvage	3.6
Nonchargeable Cull	20.6
Unregulated	0.1
Nonchargeable Miscellaneous Convertible	0.2
Total Percent Volume Increase	24.5

This volume is available only in the existing, unmanaged stands, and will decrease as these stands disappear. For future managed stands, volume adjustments will remain the same for unregulated and nonchargeable miscellaneous convertible products but will drop to zero for chargeable dead salvage and nonchargeable cull material. The total future adjustment will be 0.3%.

The salvable dead volumes per acre are obtained from the 1981 inventory statistics. This volume is not included in the empirical yield tables, but represents additional sound volume available at final harvest, and has been added to the ASQ figures from FORPLAN. These values ranged from about 2.4 to 2.6% depending on species and size class. The amount reflects a deduction to show the preservation of large snags for wildlife. To model this, two trees per acre of about 20 inches d.b.h., were deducted from the small saw diameter classes; and two trees of about 21 inches d.b.h. per acre were deducted from the large saw/old-growth diameter classes. The "no thinning" tree volumes were calculated from the managed yield tables by dividing the volume per acre by the number of trees for the desired diameter class. The managed yield tables give the volume down to a 7-inch d.b.h. with a 4-inch top. The inventory calculates merchantable volume using a 9-inch d.b.h. and a 6-inch top. At these large diameters, however, it is felt that the difference in merchantable tree size would have very little effect. There were no adjustments made for the difference in merchantable tree standards.

These yield tables apply only to the natural stands. The mortality in the managed stands will not be captured in the model, but instead it will be available for wildlife needs.

Wildlife Coefficients

Wildlife effects and outputs were estimated for Threatened and Endangered species, Management Indicator species, big game, and wildlife and fish user days. Effects on Bald Eagles, spotted owls, pileated woodpeckers, and martens is based upon allocations. Information on the amount of land needed to provide for these species can be found in FEIS, Chapter III, *Wildlife* and no additional information will be displayed here. The effects on primary cavity excavators are based on habitat estimates generated from FORPLAN. FORPLAN outputs for big game cover and forage were used to calibrate another big game model (based on the A Model to Evaluate Elk Habitat in Western Oregon) which was eventually used to generate cover constraints for some FORPLAN alternatives and to estimate effects for all alternatives. User days were estimated based on data from the Oregon Department of Fish and Wildlife in conjunction with the big game model.

Spotted Owls - Habitat capability for the Forest was calculated using the same formulas used in the Final Suppliment to the Environemntal Impact Statement for an Amendment to the Pacific Northwest Regional Guide. Acres of habitat and timber harvest levels were calculated using FORPLAN. It was assumed that harvest was evenly distributed across the available habitat. Habitat fragmentation was calculated using Forest Mature and Overmature Inventory data in the GIS system (Douglas fir and Douglas fir/true fir stands greater than 21 inches in diameter) to generate maps and randomly selected 2.1 mile circles to determine the proportion of the forest that maintained 1500 acres of habitat with a

minimum 300 contiguous acres of core to meet the habitat requirements of spotted owls. Details of the process are on file.

Pileated Woodpeckers - Forplan was used to generate the acres of suitable habitat and rate of timber harvest over time for pileated woodpeckers. Habitat was defined as Douglas fir, Douglas fir/true fir and true fir stands greater than 19 inches in diameter. The percentage of the Forest capable of supporting pileated woodpecker individuals was calculated as the number of 1 mile circles with 1000 acres of suitable habitat, including a 300 acre core.

Martens - FORPLAN was used to generate the acres of suitable habitat and rate of timber harvest over time for martens. Habitat was defined as all timber type stands greater than 19 inches in diameter. An additional forage component was added for stands between 12 and 18 inches in diameter. The percentage of the Forest capable of supporting marten individuals was calculated as the number of 1 mile circles with 600 acres of suitable habitat, including a 160 acre core.

Primary Cavity Excavators (PCEs) - Dead trees (snags) per acre greater than 18" in diameter provide estimates of the Forest's ability to provide habitat for cavity-dependent wildlife through the planning horizon. The 18" requirement is based on the needs of species known to exist on the Forest (Schreiber, 1987, Nelson, 1988). Snag coefficients for both existing and replacement timber stands are based on snags being produced by suppressed trees which are generally one inch smaller in diameter than the average tree.

If the trees are less than 18" in diameter they will not provide habitat for all primary cavity excavator's. Conversely, if more than 3.8 dead trees per acre (or 4.2 for high elevation areas) are available they may not be fully utilized because of minimum home range sizes. Therefore, the yield of snags per acre does not follow the actual number of dead trees but measures the usable dead trees only. Snags less than 18" in diameter are not reported and snags that exceed 4.2 trees per acre are not reported.

Specifically, yield simulators project that 2 snags of up to 18" in diameter will die each year for every 100 acres of 19" trees. This relationship holds for all timber types on the Forest. Based on this data, each timber yield table that is less than 19" in diameter does not produce 18" snags, yield tables between 19" and 20" contain 2 snags per acre greater than 18", and yield tables greater than 20" in diameter contain 3.8 (or 4.2) snags per acre.

Existing dead trees and live replacement trees will ensure that objectives for snags will be met in all replacement stands throughout the rotation. The number of snags in timber stands regenerated during the planning period will match the desired level (usually between 0.8 and 1.6 snags per acre).

Existing data on the longevity of any individual snag indicates that a dead tree that is about 18" in diameter will provide suitable nesting habitat for PCEs for about 50 years (Cline, S.P., 1980). In order to provide snags throughout the rotation of the replacement stand, some green trees which will eventually be killed need to be left on each harvest unit. The combination of existing snags and green replacement trees needs to be enough to maintain snag levels until the regenerated timber stand reaches at least 18" in diameter. From 1 to 3 replacement trees (depending on diameter) are required for every snag that is needed.

Big Game - Estimates of big game populations or population trends depend upon our ability to provide food (forage), various types of shelter (cover), and freedom from harassment (low road densities). In addition, size and spacing of the forage and cover need to be distributed for maximum utilization, as elk demonstrate a preference for areas that are close to both forage and cover.

Forage estimates are generated based on existing meadows, timber stand openings, and management techniques like burning and fertilization. Forage production in timber stands ends as crown closure

occurs. Optimal cover in mature and old-growth stands provide forage as the canopy opens up and allows growth of forage species. Lichens, typical to this habitat, are another important forage component.

Hiding cover is provided by any timber stand that creates short viewing distances (generally stands with trees greater than 2" in diameter). Usable thermal cover requires timber stand canopy closure and some amount of pruning of the lower branches (tree diameters greater than 8" and canopy closure greater than 50%). Optimal thermal cover provides both forage and cover in the same timber stand. This combination requires some openings in the timber canopy and multi-layered stand structures that begin to occur in stands over 170 years old.

The size and spacing variable in the Westside Model measures the distribution of forage and cover areas over the landscape, Optimally, units would be 60 acres or less and evenly distributed to allow maximum utilization of all forage areas. Cover areas should be larger, but be close to forage units.

Road density is the final variable that affects elk habitat. Low densities (less than 1.5 miles of road/square mile of habitat) limit poaching and harrassment of elk, lowering their energy needs.

The Westside Model combines all four of these variables to measure the habitat effectiveness. In addition, each variable has minimum thresholds for quality. Thus (for example) an area that has a high overall Habitat Effectiveness value due to few roads, excellent cover and high forage values would be less effective if all the forage was concentrated in one site, causing a low value for size and spacing.

Fish Coefficients - Estimates of Smolt Habitat Capability (SHC) outputs follow direction in the 1920 Memo of May, 1, 1987 on Anadromous Fish Planning Coefficients. These coefficients were developed by a Regional Anadromous Fishery Task Force.

The memo recommended that for Steelhead smolt densities be from 4 to 20 smolt/100 square meters (M^2), and spring chinook densities should be between 5 and 40 smolt/100 M^2.

The FEIS information is presented in terms of Smolt Habitat Capability (SHC) of existing habitat with adequate escapement and rehabilitation, and SHC of potential habitat with adequate escapement and rehabilitation.

The initial estimates of total SHC under existing conditions and escapement were developed in cooperation with ODFW during development of the DEIS. These estimates projected smolt densities of 2 to 4.2/100 M^2 for steelhead, and 34.5/100 M^2 for spring chinook in the McKenzie River. However the densities for steelhead were lower than suggested in the memo, and reflected current habitat conditions in the Fall Creek and Santiam River systems. The densities for chinook were at the high end of the range, but again, reflected the high quality habitat of the McKenzie River.

Smolt densities for 70 miles of additional chinook habitat was estimated as lower than the densities found in the McKenzie River. This estimate was based on field knowlege of the stream conditions available in the potential habitat.

The increase in smolts attributed to stream rehabilitation and enhancement projects was estimated to be 30 steelhead/structure, and 75 steelhead/structure, with 50 structures placed per mile. It was estimated that 60 miles of existing habitat would be rehabilitated and 30 miles of the potential habitat would be rehabilitated. When these increases were calculated they were within the range recommended in the memo.

The SHC estimated with this method was considered to be maximum under Alternatives L and W.

Estimates of the differences between alternatives were made based on a side model which accounted for erosion, riparian condition, and hydrological recovery. This side model was used in the DEIS. From the DEIS information, a regression was identified between acres harvested and decreases in smolts, and this regression was applied to the FEIS calculations.

Hydrological Recovery

Hydrological Recovery is calculated to estimate the capability of timber stands to intercept snow, rain and wind during rain on-snow events. Hydrological Recovery is used to assess the potential risk of adverse effects to stream channels and water quality from increases in peak flows during rain on snow events.

Hydrological recovery is calculated with the Aggregate Recovery Percent method. This method was first described by Forest Hydrologist J. Christner in a May 11, 1982 memo to District Rangers, with a curve describing the relationship of tree diameter and tree age to percent recovery, based on an average Forest Site Index of 91. A memo dated August 2, 1984 updated the recovery curve when it was determined that the average Site Index was 96. These recovery curves were based on studies of windspeeds in clearcuts and forested areas on the Oakridge Ranger District. (Christner 1982)

During development of the DEIS, the coefficients shown in the recovery curve of 1984 were used to develop intermediate values for each increase in tree diameter of 0.1 inches as shown in Table B-11. The recovery coefficients shown in the table were used as needed to assess the hydrological recovery in subdrainages and watersheds for the FEIS, Chapter IV. They were also combined into 6 categories for use in FORPLAN, to distribute the harvest according to the sensitivity of the watershed.

Table B-11. Hydrology Condition Recovery Coefficients

0-2 inches		2-4 inches		4-6 inches		6-8 inches	
DBH	% Recovery	DBH	% Recovery	DBH	% Recovery	DBH	% Recovery
0	0	2.0	14.0	4.0	45.0	6.0	90.0
0.1	0.4	2.1	15.2	4.1	45.0	6.1	93.3
0.2	0.8	2.2	16.4	4.2	49.4	6.2	96.3
0.3	1.2	2.3	17.6	4.3	51.6	6.3	97.0
0.4	1.6	2.4	18.8	4.4	53.8	6.4	97.1
0.5	2.0	2.5	20.0	4.5	56.0	6.5	97.3
0.6	2.4	2.6	21.6	4.6	58.4	6.6	97.3
0.7	2.8	2.7	23.2	4.7	60.8	6.7	97.6
0.8	3.2	2.8	24.8	4.8	63.2	6.8	97.9
0.9	3.6	2.9	26.4	4.9	65.6	6.9	98.0
1.0	4.0	3.0	28.0	5.0	68.0	7.0	98.4
1.1	5.0	3.1	29.7	5.1	70.2	7.1	98.4
1.2	6.0	3.2	31.4	5.2	72.4	7.2	98.6
1.3	7.0	3.3	33.1	5.3	74.6	7.3	98.8
1.4	8.0	3.4	34.8	5.4	76.8	7.4	99.0
1.5	8.0	3.5	36.5	5.5	79.0	7.5	99.2
1.6	10.0	3.6	38.2	5.6	81.2	7.6	99.4
1.7	11.0	3.7	39.9	5.7	83.4	7.7	99.6
1.8	12.0	3.8	41.6	5.8	83.6	7.8	99.6
1.9	13.0	3.9	43.3	5.9	87.8	7.9	100.0

[1] J. Christner Letter FSM 2520 (2410, 1920), August 2, 1984. Intermediate Values Derived by Linear Interpoltation.

Watershed Cumulative Effects Risk Rating

The watershed cumulative effects analysis in Chapter IV included a rating of relative risk between alternatives. Information on future riparian conditions, levels of sediment, and hydrological recovery was combined to assign a rating of High, Moderate, or Low. Information from the direct and indirect effects section for each watershed was assessed by assigning points to each of the three parameters as follows:

			POINTS
1.	RIPARIAN	Less than 4% reduction in LWD/decade	0
		4% or more reduction in LWD/ decade	1
2	INCREASE IN DEBRIS SLIDES	0% to 25% above natural	0
		26% to 40% above natural	1
		Over 40% above natural	2
3	HYDROLOGICAL RECOVERY	Meets Midpoint ARP in all subdrainages	0
		Within 1% to 5% of Midpoint ARP	1
		Exceed Midpoint ARP by over 5%	2

Watershed Risks were then assigned based on the total points.

LOW	0-1 TOTAL POINTS
MODERATE	2 TOTAL POINTS
HIGH	3+ TOTAL POINTS

Erosion Coefficients

Two different methods for developing erosion rates were evaluated: (1) Use of theoretical techniques or yield simulators, and (2) Use of empirical data. Due to the lack of an appropriate simulator for Forest erosion production and lack of time and data necessary to calibrate such a model, the decision was made to use available empirical data from the Forest and from other applicable studies. Use of actual local data was considered superior to estimates derived from models developed under different conditions.

A contract with the Pacific Northwest Forest and Range Experiment Station (PNW) in Corvallis was issued to develop the rates for the Forest. (Swanson and Grant 1982). There were several reasons why this decision was made:

- The original data were readily accessible to PNW researchers.
- Many of the people involved in the studies on the Forest were located at PNW and OSU.
- If the work was done on Forest, a review by Research would have been desirable anyway.
- PNW researchers were more familiar with current methods of analyzing erosion and erosion data than Forest personnel.

The final report is available in the Forest Planning Records and will be summarized in this section. Erosion was modeled from two sources - surface erosion and debris slides.

Surface erosion - Data were collected from nine studies - eight located in the H.J. Andrews Experimental Forest and one located near Ryder Creek, South Fork McKenzie River. Inorganic material from collection boxes were totaled for each year sampled. Sampling frequency and length varied. The studies occurred between the years 1967 through 1982. Length of sampling ranged between approximately one year to five years. Sampling frequency ranged between four collections per year to twelve collections per year. When data was missing for a period, the two adjacent periods were averaged. In some cases where it was felt that rates from individual boxes were high and not characteristic of the site, the boxes were not averaged in with the others. In addition, the report points out that the variety of measurement techniques used on different sites makes comparison between values somewhat questionable (PNW Final Report, p. 3). However the values were assumed to be comparable when data from different sites were combined to calculate the rates.

Annual yield rates per acre were calculated by dividing the weight by the estimated contributing area in both bounded and unbounded study areas. Two studies used unbounded plots which increases the uncertainty when expressing rates on an area basis since the contributing area could only be assumed. Weights were transformed into volumes by assuming the specific weight of inorganic erosion was 1.5 grams/cubic centimeter (1 gram equals 8.47×10^{-7} yd^3).

Table B-12 summarizes the surface erosion rates. Data were available for only eight Soil Resource Inventory (SRI) units so it was not possible to derive rates for the different classes of SRI surface erosion potential. Surface erosion rates are given by slope class for the background Forest condition and after clearcutting, with and without burning.

Erosion production is a dynamic process; however, it is difficult to represent temporal variations because the data are limited. In one study that sampled twelve years after treatment, observed rates were similar to the background Forest condition. The report concludes that in many sites surface erosion rates following management activity may decline to rates typical of Forested areas within ten years (PNW Final Report, P.8). None of the studies sampled for a full ten years, so some assumptions were made to derive decade averages. In the case where the site was re-sampled after twelve years, the decade value represents the average between the first and twelfth years. In all other cases, a gradual decline to the background Forest rate was assumed after the observed first and second years. Therefore,

the background rates and the rates two years after treatment were averaged to derive the first decade values.

A limited number of studies have looked at the rates of surface erosion from Forest roads. Two studies on the Forest evaluated different seeding treatments for reducing erosion of bare cut and fill slopes. Based on these studies, the report concludes that road erosion rates are an order of magnitude greater than rates for clearcut and burned sites (PNW Final Report, p.11). It also states that soil erosion rates on roads approach the clearcut, burned rate after five to seven years. Based on this information the following steps were taken by the Forest to calculate surface erosion rates for roads:

- The clearcut, burned rate was multiplied by ten to represent the rate after road construction. This rate was assumed to last for the first six years.
- The clearcut, burned rate was assumed to represent the remaining four years of the first decade.
- The higher six year rate was averaged with the four year rate to derive the first decade rate.

Table B-12. Summary of Surface Erosion Rates

	Surface Erosion Rate yd³/acre/year		
Slope Class Percent	**Background Forest Rate**	**Clearcut, Unburned 1st Decade**	**Clearcut, Burned 1st Decade**
0-30	4.7x10	0.0006	0.034
31-60	0.023	0.072	0.22
61+	0.13	0.615 [1]	1.1

Taken from PNW Final Report, Table 3 (p.33).

[1] The report did not provide a value, so it was estimated by the Forest to be the average between the Background Forest rate and the Clearcut, burned rate.

$$\frac{0.13 + 1.1}{2} = 0.615$$

Debris Slides - Debris slides have been inventoried in six studies on the Forest using a combination of aerial photos and field investigation. However, only three were done with comparable methods and standards. These three--H.J. Andrews Experimental Forest, Alder Creek, and Blue River--were used as a basis to calculate erosion production from debris slides. Landslide events were inventoried from the years 1950 through 1981. Only those greater than 100 cubic yards were recorded. Slide areas and volumes were determined from estimates of scar width, length, and depth measured in the field. Slides were assigned to an SRI unit based on their position and classed by whether they occurred in natural, managed (clearcut), or roaded areas.

In order to determine rates per acre, the Forest provided PNW with total acres in the three conditions (natural, managed, and roaded) by SRI unit. Natural areas were defined as:

- Pole stands equal to or greater than 64 acres
- Small sawtimber
- Large sawtimber and old-growth
- Noncommercial and rock
- Permanent grass

Managed areas were defined as:

- Pole stands less than 64 acres
- Nonstocked and seedling/saplings
- Treated areas as of October 1981

Road miles as of 1981 were also provided by the Forest. For each study area, miles by SRI unit were determined with a map wheel. Road acreage was calculated by assuming eight acres per mile. This area was then subtracted from the acres in the natural condition by each SRI unit.

The slide rate for a SRI unit was calculated by dividing the number of events in each management class by thirty years (the period of inventory) and then by the acres in each class. Rates were also given in terms of area and volume disturbed by multiplying an average area disturbed and volume per event as reported in the original studies.

Annual slide rates were calculated, based on 3 major SRI groups. SRI units were ranked in terms of slope and bedrock conditions with some minor modifications. SRI complexes were assigned the class of the major unit, except when the classes were unstable and stable, in which case the moderately stable class was assigned. Table B-13 summarizes the debris slide rates. The three groups were defined as:

- *Stable* with gentle slope (less than 40 percent) of any rock type, moderate slopes (40-60 percent) with hard rocks (basalt and andesite flows), and rock outcrops with little or no soil.

- *Moderately stable* with steep slopes (60 percent), hard rocks; and moderate slopes, soft rocks (tuff, brecias).

- Potentially *Unstable* with steep slopes, soft rocks.

Temporal variations are also important in predicting slides, but again the data available is less than optimal. Of 26 debris slides that were inventoried in clearcuts, 88 percent took place within ten years after harvest. The report concludes that 90 percent of the slides in clearcut areas occur in the first decade after cutting (PNW Final Report, p.16). In addition, based on the sample of road-related slides, they believe that 80 percent of the slides from roads built to current Forest Service standards occur in the first decade and 20 percent in the second decade after construction. These temporal variations were represented in the calculations.

Effectiveness of Mitigations - All work from this point forward was done by planning personnel on the Forest. The next step in the process was to estimate the effectiveness of mitigation measures used in harvest units and road construction.

The index rates from the erosion study were adjusted to reflect mitigations described by the alternative being assessed. These practices include site specific prescriptions for potentially highly unstable areas, particularly adjacent to Class IV streams, elimination of sidecast practices in road construction, and improved road drainage practices. Estimated acres of "unstable," and "moderately stable" occurring on steep upslope areas and adjacent to Class IV streams are accounted for in FORPLAN modeling in Alternative W. In this alternative, the index rates for debris slides are reduced to reflect the mitigation.

Adjustments to the index rates to reflect mitigations were based on the available research, and on discussion with watershed specialists on the Forest. The consensus was that these practices substantially reduce the potential for debris slides, but cannot entirely erase the risk, because of the unpredictability of natural conditions, and the current understanding of the mechanisms of debris slides.

Research on the reduction of debris slides has been conducted primarily in the Oregon Coast Range. The effectiveness of measures to reduce mass debris slides in harvest units was based on monitoring of headwall leave areas in Mapleton District of the Siuslaw NF, and on estimates of professional watershed specialists on the Willamette NF. The Mapleton study showed that leaving 2 to 5 acre "headwall leave areas" reduced mass debris slides approximately 63% compared to clearcuts. (Swanson & Roach p.90) The proposed mitigation measure to retain trees on Class IV streams to provide streambank stability is estimated to reduce debris slides into streams by 17%, for a total of an 80% reduction in volume failed when compared with practices as assessed in the PNW Final Report.

The magnitude of reduction of debris slides from roads was based on "Road Location and Construction Practices: Effects on Landslide Frequency and Size in the Oregon Coast Range." This paper showed that in 3 landtypes in the Coast Range the volumes of landslides were reduced from 117 cubic yards per slide on roads constructed with sidecast in the 1960s to 6 cubic yards on steeper roads, where waste material was end-hauled. On another landtype the reduction was from 265 to 111 cubic yards with the same type of improvement in practices. For the FEIS it was estimated that improved road practices would reduce debris slides to one-quarter of the 1945-1975 rates, with no average watershed rate higher than 5 cubic yards/road acre occurring.

Further adjustments were made in the erosion rates to more accurately model watershed conditions. For each erosion process influenced by management activities (road construction and timber harvest) included in the analysis, weighted average rates were calculated for each watershed. Acres were summed by different characteristics depending upon the erosion process being modeled. Factors used as a basis for weighting the rates within watersheds for individual processes included:

- Stability Class
- Slope Class
- Soil Suitability
- Availability for timber harvest
- Merchantable Timber (Pole size and larger)
- Timber Type

Table B-13 displays the rates used as a basis for calculating the weighted average rates for each process. For more information on erosion rate and volume calculations, see the Soil Erosion Process Paper.

Table B-13. Erosion Rate Summary

Erosion Type	Stability Group	Background Forest Rate	TP1 Managed Without Enhanced Protection[1]	TP2 Managed Without Enhanced Protection[1]	TP1 Managed With Enhanced Protection[1]	TP2 Managed With Enhanced Protection[1]
Surface[2] (Harvest)	0-30% slope	$4.7x10-^{7}$	0.206	0	N/A	N/A
	31-60% slope	0.023	0.161	0	N/A	N/A
	61% + slope	0.13	0.906	0	N/A	N/A
Surface[2] (Roads)	0-30% slope	$4.7x10-^{7}$	0.218	0	N/A	N/A
	31-60% slope	0.023	1.408	0	N/A	N/A
	61% + slope	0.13	7.040	0	N/A	N/A
Slide (Harvest)	Stable	0	0	0	0	0
	Moderately Stable	0.220	0.550	0.061	0.330	0.030
	Potentially Unstable	0.270	1.500	0.167	0.600	0.060
Slide (Roads)	Stable	0	4.600	1.150	1.150	0.287
	Moderately Stable	0.220	8.000	2.000	2.000	0.500
	Potentially Unstable	0.270	68.00	17.0	17.0	4.250

[1] Assumes harvest units include protection of potentially unstable stream Class IV and headwall areas, and assumes roads are constructed with compacted fills.
[2] Rates shown assume 60% of areas are burned, 40% unburned. Enhanced protections are not projected to have any effect on surface erosion rates.

Recreation Coefficients

Recreation capacity and use coefficients were developed for each of the various Recreation Opportunity Spectrum (ROS) classes. Development of these coefficients involved developing projected demand and capacity estimates for each of the categories tracked. In cases where capacity was always greater than projected demand for any Alternative, demand estimates were utilized for projected use coefficients. In cases where capacity was less than projected demand, capacity estimates were utilized for projected use coefficients. The following paragraphs describe the process used for generating these demand and capacity estimates. Detailed documentation can be found in the planning records.

In order to determine the most likely rate of change in future recreation use it was necessary to examine trends in historical data. The primary source of visitor use data for the Forest is the Recreation Information Management (RIM) System. RIM files contain use data for specific activities and sites on the Forest which can be combined into appropriate categories for analysis and display. All use and capacity data in this Appendix are expressed in terms of recreation visitor days (RVDs). One recreation visitor day equates to twelve hours of use.

A survey of the literature revealed a number of studies which developed indices or growth rates for future recreation use for various activities or groups of activities on a National, Regional, State, and local area basis. Since RIM activities are fairly specific and projections are generally only available for broader categories, some aggregation was necessary. Thus, similar RIM activities were grouped into classes for which projections were available from a number of sources. RIM data for 1980-89 were analyzed in these activity groupings. Table B-14 contains the 1980 through 1989 use by activity grouping and the percent change over this time period.

This Table shows some fluctuation in the data extracted from the RIM system. These may be the result of inconsistencies in estimating or reporting use from public and private sector sites and areas.

Despite these vagaries, relatively clear trends are evident in the data from the past decade and RIM contains the best recreation use estimates available for Forest planning analyses.

During the 1980-89 period, participation in most recreation activities increased at varying rates with some noticeable peaks, valleys, and plateaus in the trend lines. It seems evident from the figures that recreation use is affected by such variables as weather and travel costs. Although use in most activities showed some decline during the 1980-89 period total use has increased steadily. Total recreation use did not change from 1981 to 1982. This may be due in part to the economic recession that the region was going through.

Two activity groupings show a decrease in participation over the 10-year period: Organized camping and Resort use. Hiking and picnicing use dropped dramatically in 1975 in 1982 and have only recently regained their 1982 participation levels. Swimming use follows a similar pattern. Between 1982 and 1985, Swimming use decreased significantly. Since then, it has risen to approximately the 1982 level and shown increases over the last four years.

The most popular recreational activities on the Willamette National Forest are camping, driving for pleasure, fishing, and boating-related activities. In 1982, participation in these activities represented approximately two-thirds of the total recreational use on the Forest. Next in popularity were swimming, picnicking, hiking, and resort use. These activities occur at a variety of sites located throughout the Forest.

Table B-14. Recreation Use for Selected Activities[1] [2](Thousands RVDs)

Activity	1980	1981	1982	1983	1984	1985	1986	1987	1988[3]	1989[3]	Average Annual % Change 1980-89
Camping	982.0	1,027.7	1,027.7	1,053.3	1,059.1	1,101.1	1,123.9	1,207.2	1,259.6	1314.3	+ 3.4
Driving/ Sightseeing	399.1	416.2	413.1	403.1	418.4	434.4	469.8	481.0	491.7	502.7	+ 2.6
Hiking	128.7	170.2	140.9	145.8	144.2	154.2	140.9	164.8	176.8	189.7	+ 4.7
Picnicing	166.8	168.0	145.0	152.6	162.6	163.2	173.2	174.4	179.8	185.4	+ 1.1
Boating/ Waterskiing	222.9	225.4	226.3	232.2	218.8	217.5	226.3	244.1	250.1	256.2	+ 1.5
Swimming	135.2	164.9	147.7	109.2	125.6	147.9	166.2	171.0	180.9	191.3	+ 4.2
Horseback Riding	23.3	24.3	24.1	26.1	24.3	28.8	28.6	28.4	29.8	31.2	+ 3.4
Downhill Skiing	21.0	4.2	22.5	26.8	36.6	49.0	40.8	50.9	51.9	52.5	+15.0
Cross Country Skiing	12.7	9.6	16.6	25.5	26.2	29.9	23.2	31.0	32.2	34.4	+16.3
Other Winter Sports	36.9	30.5	37.2	37.5	45.7	46.3	44.3	48.2	51.4	54.8	+ 4.9
Organization Camping	79.1	69.0	69.2	70.4	71.8	62.2	64.6	60.2	61.1	62.2	- 2.1
Resort Use	116.6	117.8	119.0	90.5	93.7	96.8	94.5	98.2	99.2	100.2	- 1.4
VIS	56.1	54.5	57.7	66.1	61.1	62.4	64.3	61.2	62.8	64.5	+ 1.5
Hunting	84.6	86.7	85.8	84.0	84.4	89.1	85.8	99.5	102.8	106.2	+ 2.6
Fishing	261.5	233.4	260.7	256.4	253.4	266.9	274.4	297.2	307.6	318.3	+ 2.2
Other	65.8	85.3	93.8	94.1	99.9	101.8	93.8	80.7	83.5	86.4	+ 3.2
TOTAL	2,792.3	2,887.7	2,887.7	2,873.6	2,926.2	3,053.9	3,114.1	3,268.0	3,421.2	3,551.1	+ 2.7

[1]Source: USDA Forest Service, Recreation Information Management System (RIM).
[2]Includes use attributed to Wilderness.
[3]Source: Estimates of Forest use based on historical use patterns.

Future recreation use will likely be affected by changes in various socioeconomic indicators (e.g., population growth, disposable income, leisure time, etc.), the availability of opportunities, technology, weather conditions, and other variables. For Forest planning purposes, it is necessary to develop estimates for dispersed, developed, and Wilderness use for the 50 year planning horizon. Due to large uncertainties about the variables affecting future use, projections become more tenuous as they are extended further into the future.

Studies which have developed future growth projections for recreation cannot anticipate fluctuations in weather patterns nor predict events such as world energy crises or economic recession. Their projections generally assume that an underlying demand is present and will increase with a growing population that has an ever-increasing awareness and appreciation of recreation values. Based on these factors and the general trends in past use on the Willamette, it seems appropriate to assume that future participation in all activities on the Forest will increase as long as opportunities are provided.

To determine future participation rates for all activities in the Forest, recreation activity projection rates of three separate studies were reviewed. During the DEIS projection rates of the State Comprehensive Outdoor Recreation Plan-Oregon (SCORP-Oregon); Projections of Future Forest Use, USDA Forest Service, 1979; and Pacific Northwest River Basin Commission, 1979 were compared. The annual growth rates for recreation use developed in the River Basins Commission study were selected for making use projections in the development of the DEIS and Draft Forest Plan.

However since release of the DEIS and Draft Forest Plan, more recent studies of user preferences, and use projections for a wide range of recreational activities have been completed. In addition historical use data for the Forest has been updated for more accurate comparisons with use projections of recent studies. In 1987 the Pacific Northwest Outdoor Recreation Study (NORS) was completed and in 1988 a draft of the State Comprehensive Outdoor Recreation Plan (SCORP) for Oregon Was issued. The NORS study is a regional approach to integrated recreational planning and management among public agencies and is directly related to SCORP processes of participating states. The NORS study included the states of Washington, Oregon and Idaho.

The SCORP utilizes NORS results from the Oregon Survey portion of the study. Further, Oregon's SCORP subdivides the state into geographic regions for the purposes of recreation planning. The Willamedtte National Forest is included in the State's Mid-Willamette Valley Region (Region 8). Oregon's SCORP provides recreation use projection rates for activity groups for each of it's regions. Average annual growth rates for activities within SCORP Region 8 for 1991-2010 are displayed in Table B-15.

The annual growth rates for recreation activities presented in the draft SCORP and developed through the NORS study were selected for making use projections for the Forest's FEIS and Forest Plan. Use projections for the Mid-Willamette Valley, SCORP Region 8, closely approximate the Forest's historical use trends for the period 1980-1989. They were selected for use because they exceed SCORP projection rates on a state-wide basis, are specific to the Forests primary area of influence, are the most current projection rates available, and are also the highest projection rates for all studies reviewed and thus may show the upper level of use expected in the year 2010.

Table B-15. Recreation Projection Rates

Activity Group	1991-2010 Rate[1]	2011-2040 Rate[2]
Cammping	3.7	1.40
Driving/Sightseeing	4.9	1.40
Hiking/Walking	4.1	1.40
Picnicking	3.8	1.40
Boating/Waterskiing	5.5	1.40
Swimming	4.2	1.40
Horseback Riding	1.7	1.40
Downhill Skiing	2.6	1.40
Cross Country Skiing	2.8	1.40
Other Snow Activities	3.1	1.40
Organized Camping	1.0	1.40
Resort Use	1.0	1.40
Visitor Information	2.5	1.40
Hunting	2.5	1.40
Fishing	2.5	1.40
All Other Activities	2.5	1.40

[1]Source: Oregon State Comprehensive Outdoor Recreation Plan (SCORP)-Draft 1988. Activity groupings listed in SCORP were grouped according to the categories shown above. Projection rates for this time period represent a moderate scenario of future use for SCORP's Mid-Willamette Vlley Region 8.
[2]Source: Bonneville Power Administration 1982. Forecasts of electricity consumption for the Pacific Northwest.

Selecting an appropriate growth rate for recreation participation beyond the year 2010 is more difficult since there are few projections of the underlying factors affecting these activities. An annual average rate of 1.4% for the period 2011-2040 is assumed for the Forest. This rate represents an extension of the Bonneville Power Administration (BPA) forecasts of electricity consumption in the Pacific Northwest (Appendix I, Economic/Demographic Projections, May 1982), and projected population growth rates for the Pacific Northwest and the State of Oregon.

As mentioned earlier, RIM site data are useful for distinguishing between dispersed and developed use. The Wilderness portion of dispersed use is contained in separate tabulations by Wilderness Area. The 1980 to 1989 historical RIM data were examined to determine if the proportions of dispersed, developed, and Wilderness use were changing significantly over time (i.e., is one type growing at a faster rate than another?). Although some annual fluctuations exist, the 10 year average was very close to the 1982 proportions. Thus, the most recent data available were used as the base for projections. It was assumed that activities will continue to occur in the same proportions within the broad categories of dispersed, developed, and Wilderness use throughout the projection period.

To facilitate comparisons with capacity estimates, projections for developed use were estimated by applying the growth rates to activity use within specific types of sites (e.g., observation sites, picnic areas, campgrounds, etc.).

For dispersed and Wilderness use, the growth rates were applied to the activity totals to obtain total use for each time period. Total use was disaggregated to Recreation Opportunity Spectrum (ROS and WROS) classes to facilitate comparisons with existing and potential supply categories. ROS classes are combinations of physical, social, and activity settings which provide a certain type of recreational experience. The disaggregation of activity use to ROS classes was based on observed patterns of activity

participation in Forest recreational settings. A summary of dispersed, developed, Wilderness, and total use projections unconstrained by supply is presented in Table B-16.

Table B-16. Total Projected Recreation Use

	Thousands of RVDs per Year					
Use Type	**Current Use**	**1991 - 2000**	**2001 - 2010**	**2011 - 2020**	**2021 - 2030**	**2031 - 2040**
Developed	1,723	2,056	2,953	3,393	3,899	4,481
Dispersed	1,481	1,790	2,623	3,014	3,464	3,980
Wilderness	345	413	596	685	787	905
Total	3,549	4,259	6,172	7,092	8,150	9,366

The second major component of recreation use coefficients are the capacity estimates. These were constructed for dispersed, developed, and Wilderness recreation. The estimated capacity values are an expression of use that may occur without degradation of the physical resource and/or the intended experience opportunity of the users.

Supply coefficients were developed for dispersed recreation activities in each of the ROS classes. The following formula was used to generate these coefficients:

RVD/AC/YR/PC = RVD/AC x US x LOS x PU

Where: **RVD/AC/YR/PC =** A dispersed recreation use production coefficient expressed as the practical use capacity in recreation visitor days per acre per year.

RVD/AC = A per-acre use density in visitor days for a 100-day period. This density value applies to the area of coincidence between one of five ROS classes and one of three Forest land suitability classes having slopes of less than 60 percent.

US = A multiplier to adjust the per-acre use density for use seasons greater or less than 100 days in length.

LOS = A value that expresses the average length of time a user would remain engaged in recreation activities within an ROS class setting.

PU = A value that reflects the relationship between the average weekend and weekday pattern of use in dispersed areas.

The per-acre use density values in the formula (RVD/AC) derive from Table 10 in the ROS User's Guide (FSH 2309.09). However, rather than utilizing only the values provided for the coniferous Forest eco-region, a range of values were used. The values selected for use were those by eco-region that are correlated with three general land suitability categories of the west side Douglas-fir type in the Willamette National Forest.

Correlation by land suitability class permits calculating an ROS class capacity in a manner that recognizes the relationship between the physical nature of the landscape and the kind of opportunity to be provided. That is to say, the more densely forested land types are typically able to accommodate more visitors

per acre than nonforested land types, and maintain a desired recreation experience. The correlation is illustrated in Table B-17.

Season of use values (US) are expressed as multipliers since RVD/AC density values from the ROS User's Guide are based on a 100-day use season. The use of a multiplier ensures accounting for use capacity for periods greater or less than 100 days in length. Determination of the use season duration and respective multipliers is based on the assumptions that work and leisure time patterns of use, agency regulations, and local or regional weather patterns each influence the actual length of the recreation use season. The extent of influence these factors have upon the use season is based upon the judgement of resource management specialists. Use season durations were expressed in actual days for each Ranger District by ROS class. District values were summed by ROS class and divided by seven to determine a Forest-wide average.

Length of stay (LOS) values used in calculating practical capacity for dispersed ROS classes were also obtained from the Districts. Values were expressed in hours for the length of time users would remain, on the average, within one of the ROS settings. The judgement of field managers in determining these values is based upon use surveys and their observational experience of user behavior for a variety of dispersed recreational activities. District values were summed for each class and divided by seven to determine LOS averages for the Forest. These values were then divided by 12 to derive an RVD equivalent LOS value for each ROS class.

Table B-17. ROS Class Use Density Correlation

Correlation Categories		ROS Class Use Density Coefficients [1]				
Land Class	Eco-Region [1]	P	SPN	SPM	RN	RM [2]
Non-Forest Land	Tundra	0.45	1.05	2.4	6.0	6.0
Suited Forest Land	Coniferous Woodland	1.05	2.40	6.0	15.0	10.0
Unsuited Forest Land	Coniferous Woodland	0.75	1.72	4.2	10.5	8.0
Unsuited Forest Land	Evergreen Woodland	0.75	1.72	4.2	10.5	8.0
Unsuited Forest Land	Deciduous Forest	0.75	1.72	4.2	10.5	8.0
Non-Forest Land	Grassland	0.45	1.05	2.4	6.0	6.0
Non-Forest Land	Desert Shrub	0.45	1.05	2.4	6.0	6.0
Non-Forest Land	Lava Flows/Gypsum	0.4	1.05	2.4	6.0	6.0
Suited Forest Land	Riparian	1.05	2.40	6.0	15.0	10.0

[1] From ROS Users Guide, Table 10, p. 38. Values are RVDs/Ac/100-day season.
[2] Use Densities for the Roaded Modified Class are assumed to be similar to those of the Roaded Natural Class. This assumption is based on recent Research, by Roger N. Clark et al., that addresses dispersed roaded recreation in the PNW.

Pattern of use ratios for weekday to weekend use were obtained from the Districts and expressed as decimal factors for each District, based upon Table 9 from the ROS User's Guide (FSH 2309.13). Pattern of use values represent the relationship between the number of users for an average single weekday and an average single weekend day. These values, based upon dispersed use records and resource managers experience, were summed and divided by seven to determine an average pattern of use adjustment factor for the Forest.

The final major step was to compare capacity estimates with demand projections, both expressed on a per acre basis. Whichever coefficient was smaller was used as the projected use coefficient.

Similar procedures were followed for generating use coefficients for developed recreation and Wilderness use. Detailed documentation of these procedures is available in the planning records.

ECONOMIC EFFICIENCY ANALYSIS

This section describes cost-efficiency criteria and explains how net public benefits are measured. The analysis is required by NFMA regulations (36 CFR 219) and plays an important part in the development, comparison, and selection of Forest planning alternatives. The results of the assumptions and procedures discussed in this section are displayed in Chapter II of the FEIS and later in this appendix, *Analysis Prior to Development of Alternatives* and *Estimating Effects* sections.

Net Public Benefits

Maximization "of net public benefits in an environmentally sound manner" (36 CFR 219.1(a)) is a goal of the Forest planning process. Net public benefits are the "overall long-term value to the nation of all outputs and positive effects (benefits) less all the associated Forest inputs and negative effects (costs) whether they can be quantitatively valued or not" (36 CFR 219.3). Net public benefits represents the sum of the net value of priced outputs plus the net value of nonpriced outputs. Net public benefits cannot be expressed as a numeric quantity because the net value of priced outputs and effects cannot be added to qualitatively valued nonpriced outputs and effects.

Economics attempts to estimate the benefits and costs associated with all management options for planning National Forest management; in reality, it is very difficult to obtain adequate data for estimating either the costs involved in the production of Forest outputs or the benefits of many of the Forest resources. This is especially true when making estimates for a distant future such as 50-150 years. As a result, different procedures are used to estimate benefits and costs, and there are several resources or indirect costs which cannot be adequately addressed in the benefit and cost calculations. This does not mean that these are not important or are ignored in the Forest planning process, but that economics is unable to develop methods of recognizing them in estimates of efficiency. These are considered to be nonpriced benefits or costs. While they are not considered in measures of economic efficiency, they are considered in the evaluation of net public benefits.

Present Net Value

The primary criterion for measuring the value of the Forest is present net value (PNV) (FSM 1971.3). PNV represents the dollar difference between the discounted value of all outputs to which monetary values are assigned and the discounted cost of managing the Forest for the next 150 years. Priced outputs include market resources (timber, recreation special uses, recreation user fees, grazing, land uses, power, and minerals) as well as nonmarket resources (developed, dispersed and wilderness recreation, including recreation associated with wildlife and fish habitat).

The PNV calculated in FORPLAN was added to the discounted benefits and costs not modeled in FORPLAN. The total PNV was the primary indicator used to evaluate the overall economic efficiency of the benchmarks and alternatives. The benefits and costs not included in FORPLAN were those which do not significantly influence and are not significantly influenced by management prescription assignment and output scheduling in FORPLAN, and those deemed to be better modeled outside FORPLAN to achieve a feasible schedule (primarily road construction).

Parameters

Adjusting for Inflation

The timber values and costs actually used in the FORPLAN model and in data bases for those costs outside the model are in base year 1988 as this made the most sense to Forest personnel involved in developing these values and costs at that time. In the FEIS and associated appendices, benefits and costs are expressed in 1982 dollars to be consistent with the 1985 RPA Program analysis (FSM 1970.74). The gross national product implicit price deflator index as reported in the Economic Report of the President (US Government Printing Office 1989) was used to adjust benefits and costs for inflation to the 1982 base (see Table B-19).

Discounting

A discount rate of 4% was used to convert all benefits and costs to a common point in time. The 4% rate approximates the return on investments for Aaa corporate bonds for the period 1960 to 1978 above the rate of inflation (Row et al 1981). It was used to formulate and evaluate all benchmarks and alternatives.

All costs and benefits were discounted from the midpoint of each decade.

Costs

Costs were estimated for the 150-year period for the benchmarks and alternatives for all management activities. This discussion explains how costs were developed, the major expenditure categories, and funding sources. Table B-18 displays the management activities and how they are classified and modeled.

Cost Development and Modeling Process

Costs were reviewed and revised between the DEIS and FEIS to reflect current practices and the current accounting system. The costs developed in the draft were based on the Management Information Handbook (MIH) coding system. This system has been replaced by the National Activity Structure Handbook (FSH 1309.16). The cost structure was set up to be similar to the codes used by Forest Service managers in developing outyear budgets. The new cost information was incorporated in Alternatives K, A, J, W, D, and L, and the Timber and PNV benchmarks for the FEIS.

Costs for each resource management program were developed by Forest personnel in conjunction with developing standards and guidelines for management prescriptions. Resource specialists and Forest staff estimated costs for all activities based on historical data and professional judgement of any changes needed to meet the intent of the alternative. The costs represent the minimum funds needed to achieve the standards and guidelines in the management prescriptions. Costs include both direct costs of resource management and resource coordination costs to produce primary outputs in an environmentally acceptable way and/or mitigate short-term impacts. Costs were assumed to occur at the midpoint of each planning decade. The figures are calculated as average annual costs over each decade.

Three types of costs were estimated: fixed Forest Service costs, variable Forest Service costs, and purchaser costs. **Fixed costs** are the costs which do not vary over time within an alternative. Fixed costs were allowed to change between alternatives to reflect changes in the scale of management emphasis for each alternative. For example, more costly mitigation measures may be needed for alternatives which emphasize timber production. Many of the fixed costs are necessary to meet legal requirements

of ensuring public safety and environmental protection. The others are those which would not significantly effect the FORPLAN results and had no direct relation to the timber harvest levels. These costs were estimated by resource specialists and Forest staff as the least cost estimates needed to meet the intent of the alternative being analyzed. Fixed costs are identified in Table B-18 under the column "Cost Type." This table also shows how these costs were allowed to vary between alternatives.

Variable costs vary with the output level of each benchmark or alternative. They include capital investments and operational costs. Variable costs are modeled as either FORPLAN costs or as "variable-other" costs. These are identified in Table B-18 under the column "Cost Type." FORPLAN variable costs are those which vary directly with the level of timber production and are used in the FORPLAN model. "Variable-other" costs will vary over time within an alternative. Most of the "variable-other" costs are those associated with road construction and reconstruction." Each management prescription has a unique set of variable costs.

Purchaser costs are those needed for logging and transporting logs to the mill. Logging system costs were developed for three logging system groups: ground, skyline, and aerial. Each of the FORPLAN Level 1 watersheds was analyzed to determine acres of suitable ground in each of the three logging system groups and an average logging cost was applied.

The average annual costs for 1st, 2nd and 5th decades and the discounted costs for the 150-year period are displayed for the benchmarks and alternatives in several tables in Chapter II of the FEIS. Also see the section, *Estimating Effects*, in this appendix.

Cost Categories and Funding Sources

Costs were identified as either operations and maintenance (OM) (the cost of planning and managing existing resources and assets) or as investment (the cost of creating or enhancing assets). Investments on the Forest include roads, wildlife improvements, reforestation, recreation facilities including trails, and administrative facilities. Major operations and maintenance costs are for planning, maintenance, long-term protection, and administration. These costs are identified in Table B-18 under the column labeled "Cost Class."

Real Cost Changes

Costs are assumed to remain constant relative to inflation over the 150-year planning period. However, the average unit costs of many activities may change over time as different types of treatment are implemented. For example, the average sale preparation costs are expected to increase when the proportion of timber harvest volume coming from commercial thinning increases.

Table B-18. Cost Class by Activity

Activity	Description	Units	Cost Class	Cost Type
AC	Cultural Resource Activities	ACRES	OM	FORPLAN
AN11	Recreation Resource Prep	per year	OM	FIXED
AN12	Recreation Resource Planning	per year	OM	FIXED
AN121	Recreation Sites & Facilities Planning	per year	OM	FIXED
AN22	Recreation Resource Imprvmnt Constructn	per year	INV	FIXED
AN23	Rec Res Imprv Maint	per year	OM	FIXED
AT11	Trail Preparation	per year	OM	FIXED
AT12	Trail Administration	per year	OM	FIXED
AT12	Trail Monitoring	per year	OM	FIXED
AT22	Trail Construction	per year	INV	FIXED
AT23	Trail Maintenance	per year	OM	FIXED
AV	Visual Resource Activities	per year	OM	FIXED
AW11	Wilderness Resource Preparation	per year	OM	FIXED
AW12	Wilderness Resource Administration	per year	OM	FIXED
AW121	Wilderness Resource Monitoring	per year	OM	FIXED
ET113	Timber Resource Coordination	ACRES	OM	FORPLAN
ML	Land Management Planning Activities	per year	OM	FIXED
PL132	Law Enforcement (Forest Service)	per year	OM	FIXED
CF1	Fish Operations	per year	OM	FIXED
CF121	Fish Habitat Monitoring	per year	OM	FIXED
CF221-KV	Fish Habitat Improv-Structures-CWKV	per year	INV	FIXED
CF221-NF	Fish Habitat Improv-Structures-NFWF	per year	INV	FIXED
CF2221	Resident Fish Non-Structural Improvement	per year	INV	FIXED
CF2222	Anadromous Fish Non-Structural Imprvmnt	per year	INV	FIXED
CF23	Fish Habitat Improvement Maintenance	per year	OM	FIXED
CT1	T&E Operations	per year	OM	FIXED
CT121	T&E Habitat Monitoring	per year	OM	FIXED
CT221	T&E Structural Habitat Improvement	per year	INV	FIXED
CT222	T&E Non-Structural Improvement	per year	INV	FIXED
CW1	Wildlife Operations/Planning	per year	OM	FIXED
CW121	Wildlife Habitat Monitoring	per year	OM	FIXED
CW221	Wildlife Habitat Structural Improvements	per year	INV	FIXED
CW222	Wildlife Habitat Non-Structurl Imprvmnts	per year	INV	FIXED
CW23	Wildlife Habitat Improvement Maintenance	per year	OM	FIXED
ET113	Timb Resource Coord	ACRES	OM	FORPLAN
ML	Land Management Planning Activities	per year	OM	FIXED
PL132	Law Enforcement (Forest Service)	per year	OM	FIXED
DN1	Range Resource Operations	per year	OM	FIXED
DN221	Range Resource Structural Improvements	per year	INV	FIXED
DN222	Range Resource Non-Structrl Improvements	per year	OM	FIXED
DN24	Noxious Farm Weeds	per year	OM	FIXED
ET1112	Silvicultural Examination & Rx	ACRES	OM	FORPLAN
ET112	Timber Resource Planning	ACRES	OM	FORPLAN
ET114	Timber Sale Preparation	ACRES	OM	FORPLAN
ET114x	Tbr Sale Prep - Roadless Entry + Pub Aff	per year	OM	FIXED
ET12	Timber Harvest Administration	ACRES	OM	FORPLAN
ET12xx	Timb Admin - Reservoir Sweeping	per year	OM	FIXED
ET24	Reforestation (ET241-244)	ACRES	INV	FORPLAN

Table B-18 Cont. Cost Class by Activity

Activity	Description	Units	Cost Class	Cost Type
ET251	TSI-Release & Weeding	ACRES	INV	FORPLAN
ET252	TSI-Precommercial Thinning	ACRES	INV	FORPLAN
ET253	TSI-Pruning	per year	OM	FIXED
ET255	TSI-Fertilization	ACRES	INV	FORPLAN
ET27	Genetic Tree Activities	per year	INV	FIXED
ML	Land Management Planning Activities	per year	OM	FIXED
PL132	Law Enforcement Activities	per year	OM	FIXED
ET113	Timber Resource Coordination	ACRES	OM	FORPLAN
FA121	Air Quality Monitoring (for Wilderness)	per year	OM	FIXED
FW1	S&W Admin/Monitor FW111/FW112/FW12	per year	OM	FIXED
FW111	Watershed Resource Inventory(Soil&Water)	per year	OM	FIXED
FW112	Watershed Resource Planning	per year	OM	FIXED
FW12	Watershed Resource Administration	per year	OM	FIXED
FW121	Watershed Resource Monitoring	per year	OM	FIXED
FW22	Watershed Resource Imprvmnt Construction	per year	INV	FIXED
FW23	Watershed Resource Imprvmnt Maintenance	per year	OM	FIXED
FW23-KV	Watershed Resource Imprvmnt Maint- CWKV	per year	OM	FIXED
FW23-NF	Watershed Resource Imprvmnt Maint- NFWF	per year	OM	FIXED
ML	Land Management Planning Activities	per year	OM	FIXED
ET113	Timber Resource Coordination	ACRES	OM	FORPLAN
GM1	Minerals & Geology Resource Prep&Admin	per year	OM	FIXED
ML	Land Management Planning Activities	per year	OM	FIXED
PL132	Law Enforcement (Forest Service)	per year	OM	FIXED
AC	Cultural Surveys for Land Exchange	ACRES	OM	VAR-OTH
CT1	T&E Surveys for Land Exchange	ACRES	OM	VAR-OTH
JL111	Lands Inventory	per year	OM	FIXED
JL122	Special Use (S/U) Administrtn (non-rec.)	per year	OM	FIXED
JL123	Land Ownership Administration	per year	OM	FIXED
JL23	Lands Activity Maintenance	per year	OM	FIXED
JL24	Landline Location	per year	INV	VAR-OTH
JL26	Land Ownership Adjustments	per year	OM	FIXED
PL132	Law Enforcement (Forest Service)	per year	OM	FIXED
L05.0_A	5.0 Augmentation-Timber-Constructuion	per year	OM	FIXED
L05.0_B	5.0 Augmentation-Timber-Reconstruction	per year	OM	FIXED
L07.0_A	7.0 Transp Admin-Gen Purp-Construction	per year	OM	FIXED
L07.0_B	7.0 Transp Admin-Gen Purp-Reconstruction	per year	OM	FIXED
L07.0_C	7.0 Transp Admin-Recreation-Construction	per year	OM	FIXED
L07.0_D	7.0 Transp Admin-Recreation-Reconstruct	per year	OM	FIXED
L07.0_E	7.0 Transp Admin-Timber-Construction	per year	OM	FIXED
L07.0_F	7.0 Transp Admin-Timber-Reconstruction	per year	OM	FIXED
L08.0_A	8.0 Program Support-Gen Purp-Construct	per year	OM	FIXED
L08.0_B	8.0 Program Support-Gen Purp-Reconstruct	per year	OM	FIXED
L08.0_C	8.0 Program Support-Recreation-Construct	per year	OM	FIXED
L08.0_D	8.0 Program Support-Recreation-Reconstr	per year	OM	FIXED
L08.0_E	8.0 Program Support-Timber-Construction	per year	OM	FIXED
L08.0_F	8.0 Program Support-Timber-Reconstruct	per year	OM	FIXED
L08.3_A	8.3 Forest Planning-Gen Purp-Constr	per year	OM	FIXED
L08.3_B	8.3 Forest Planning-Gen Purp-Reconstr	per year	OM	FIXED
L08.4_A	8.4 Law Enforcemnt-Gen Purp-Constr	per year	OM	FIXED
L08.4_B	8.4 Law Enforcemnt-Gen Purp-Reconstr	per year	OM	FIXED

Table B-18 Cont. Cost Class by Activity

Activity	Description	Units	Cost Class	Cost Type
L08.5_A	8.5 ROW Support-Timber-Construction	per year	OM	FIXED
L08.5_B	8.5 ROW Support-Timber-Reconstruction	per year	OM	FIXED
L11TBCON	11.0 PCP Road C/R-Timber-Construction	Miles	INV	VAR-OTH
L11TBREC	11.0 PCP Road C/R-Timber-Reconstruction	Miles	INV	VAR-OTH
L12TBREC	12.0 PCP Bridge C/R-Timber-Reconstruct	Bridge	INV	VAR-OTH
L1GENCON	1.0 Construction-Gen Purpose-Constructn	Miles	INV	VAR-OTH
L1GENRCN	1.0 Construction-Gen Purpose-Reconstruct	Miles	INV	VAR-OTH
L1RECCON	1.0 Construction-Recreation-Construction	Miles	INV	VAR-OTH
L1RECREC	1.0 Construction-Recreation-Reconstructn	Miles	INV	VAR-OTH
L1TBRCON	1.0 Construction-Timber-Construction	Miles	INV	VAR-OTH
L1TBRREC	1.0 Construction-Timber-Reconstruction	Miles	INV	VAR-OTH
L21TBCON	21.0 PEP Road C/R-Timber-Construction	Miles	INV	VAR-OTH
L21TBREC	21.0 PEP Road C/R-Timber-Reconstruction	Miles	INV	VAR-OTH
L2TBRCON	2.0 Rights-of-way-Timb-Construction	ROW Case	INV	VAR-OTH
L3GENCON	3.0 Const Eng-Gen Purpose-Construction	Miles	INV	VAR-OTH
L3GENREC	3.0 Const Eng-Gen Purpose-Reconstruct	Miles	INV	VAR-OTH
L3RECCON	3.0 Const Eng-Recreation-Construction	Miles	INV	VAR-OTH
L3RECREC	3.0 Const Eng-Recreation-Reconstruction	Miles	INV	VAR-OTH
L3TBRCON	3.0 Const Eng-Timber-Construction	Miles	INV	VAR-OTH
L3TBRREC	3.0 Const Eng-Timber-Reconstruction	Miles	INV	VAR-OTH
L4GENCON	4.0 Pre-Constr Eng-Gen Purp-Construction	Miles	INV	VAR-OTH
L4GENREC	4.0 Pre-Constr Eng-Gen Purp-Reconstruct	Miles	INV	VAR-OTH
L4RECCON	4.0 Pre-Constr Eng-Recreate-Construction	Miles	INV	VAR-OTH
L4RECREC	4.0 Pre-Constr Eng-Recreate-Reconstructn	Miles	INV	VAR-OTH
L4TBRCON	4.0 Pre-Constr Eng-Timb-Construction	Miles	INV	VAR-OTH
L4TBRREC	4.0 Pre-Constr Eng-Timb-Reconstruction	Miles	INV	VAR-OTH
L6TBRREC	6.0 Bridges-Timber-Reconstruction	Bridge	INV	VAR-OTH
LF1/LF2	Facility Activities/Improvements	per year	INV	FIXED
LF22	Facility Construction	per year	INV	FIXED
LF22VIS	I5 Visitor Centers (2, shared 6 ways)	per year	INV	VAR-OTH
LF23	Facility Maintenance	per year	OM	FIXED
LG	Geometronics Activities	per year	OM	FIXED
LQUARTER	Quarters	per year	OM	FIXED
LT23	Road Maintenance	per year	OM	VAR-OTH
PL132	Law Enforcement (Forest Service)	per year	OM	FIXED
ML	GIS Data Acquisition & Updating	per year	INV	FIXED
ET113	Timber Resource Coordination	ACRES	OM	FORPLAN
ML	Land Management Planning Activities	per year	OM	FIXED
PF11	Fire Management Preparation	per year	OM	FIXED
PF2	Fuels Improvements	ACRES	OM	FORPLAN
PL121	Regular CLE Agreements	per year	OM	FIXED
PL122	Cannabis CLE Agreements	per year	OM	FIXED
PL131	Drug Control (Non-Cooperative)	per year	OM	FIXED
PL132	Law Enforcement (Forest Service)	per year	OM	FIXED
TG4	Program Support	per year	OM	FIXED
TG3	Line Support	per year	OM	FIXED
TG4	Program Support	per year	OM	FIXED
FLC	Fixed Log Cost	ACRES	PC	PURCHASE
VLC	Variable Log Cost	MCF	PC	PURCHASE

Benefit Values

Benefits were estimated for a 150 year period for the benchmarks and alternatives for outputs that are or could be exchanged in the marketplace: timber harvest, recreational special uses, recreational user fees, grazing, land uses, power, minerals and the full spectrum of recreational opportunities (from fully developed to wilderness). The values reflect the potential dollar return even though money may not actually be collected. Benefits were assumed to occur at the midpoint of each planning decade. The benefits are calculated as average annual benefits for each decade. This section explains the methods used to estimate current and future values for Forest outputs.

Timber Values

The base timber values for the Forest were obtained from the Timber Statement of Accounts data base. These values represent high bid stumpage by species for volume harvested from Forest sales over an eleven year period - April 1977 to September 1988. See Figures B-1 to B-4 for an overview of how these values have varied for each species within each of the four timber types used. The timber values and costs used in the FORPLAN model are in base year 1988 as this made the most sense to Forest personnel involved in developing these coefficients at that time. All values displayed in the FEIS were then converted to base year 1982 dollars using GNP implicit price conversion factors (see Table B-19). Economic costs and values are displayed in base year 1982 to be consistent and allow comparison with other Forest FEIS's in Region 6.

Real Price Changes - The demand of the economy for different goods and services and the ability of the economy to produce these goods will actually determine the price of any particular item. The interaction of demand and supply will determine both the price of the item and the quantity exchanged. When demand for a good rises (falls) and the ability of the economy to produce the good remains the same, prices will rise (fall). When a change such as this manifests itself over time and the price of a good changes at a rate significantly different from the change in prices of the economy as a whole, a real price change has occurred. For estimating projections of future costs and benefits, the Forest assumed, based upon Regional direction, that there will not be real price changes, except for the value of timber stumpage. This value is assumed to experience a 1% real price increase annually from decade one to decade five. This price trend assumption is based both upon historic evidence and likely scenarios of future markets. Since stumpage is not directly represented in the Forest's FORPLAN model, and pond values are, this price trend is applied both to pond value and logging costs (the difference between pond value and logging costs is stumpage value). The implications of this price trend assumption are described in the *Analysis Prior to the Development of Alternatives* later in this Appendix.

Price-Quantity Relationships - The prices assigned to resource outputs were not related to outputs levels unless outputs levels exceeded projected use (i.e., demand schedules are assumed to be horizontal for the range of outputs explored in the benchmarks and alternatives except for certain types of recreation opportunities). The demand for timber is assumed to be horizontal (Sirmon 1983).

The process used used to obtain the desired pond values in dollars per MCF for existing and managed stands is as follows:

1. The base stumpage values were combined into timber types by taking a volume-weighted average of the appropriate species. Table B-20 contains the results of this exercise.

2. Forest-wide average logging costs and manufacturing costs were calculated (based on 2400-17 Timber Data) and were added to the stumpage values to obtain manufacturing values by timber type. Table B-21 displays these results.

3. Volume-weighted price-diameter relationships were developed for the Douglas-fir/western hemlock and Douglas-fir/true fir timber types using tables adapted from work done by Snellgrove and Cahill at the PNW Experiment Station (see 4/27/84 Regional Forester's Directive, subject "Economic Analysis Revision of November 10, 1983, Regional Direction Package). The index for lodgepole pine was used for the mountain hemlock type. Table B-22 contains the price-diameter indices for the timber types.

4. The average manufacturing values by timber type were assigned to the index diameter which represented the average group diameter from a sample of approximately 100 active timber sales on the Forest. Manufacturing values by diameter were calculated.

5. Average manufacturing costs were subtracted from the manufacturing values by diameter to get pond value or mill values by diameter.

6. Board-foot to cubic-foot conversion ratios by diameter for existing and managed stands were applied to pond value to get $/MCF. Table B-23 contains the results of steps 4 to 6.

Pond values by timber types and diameter were used in FORPLAN to allow the model to select between analysis areas with differing logging costs. The net of pond values minus logging costs, commonly referred to as "stumpage", represents an economic value collected as a cash receipt.

Figure B-1. Values of Species in Douglas Fir/True Fir

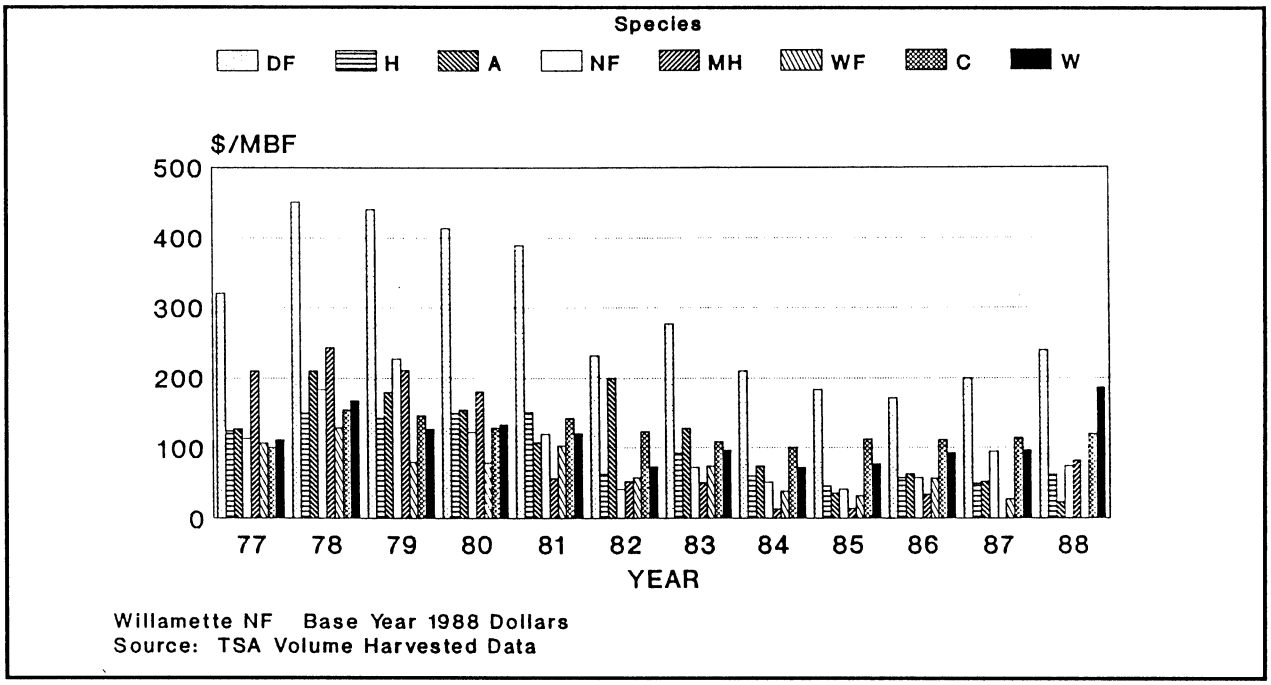


Figure B-2. Values of Species in Douglas Fir/Hemlock

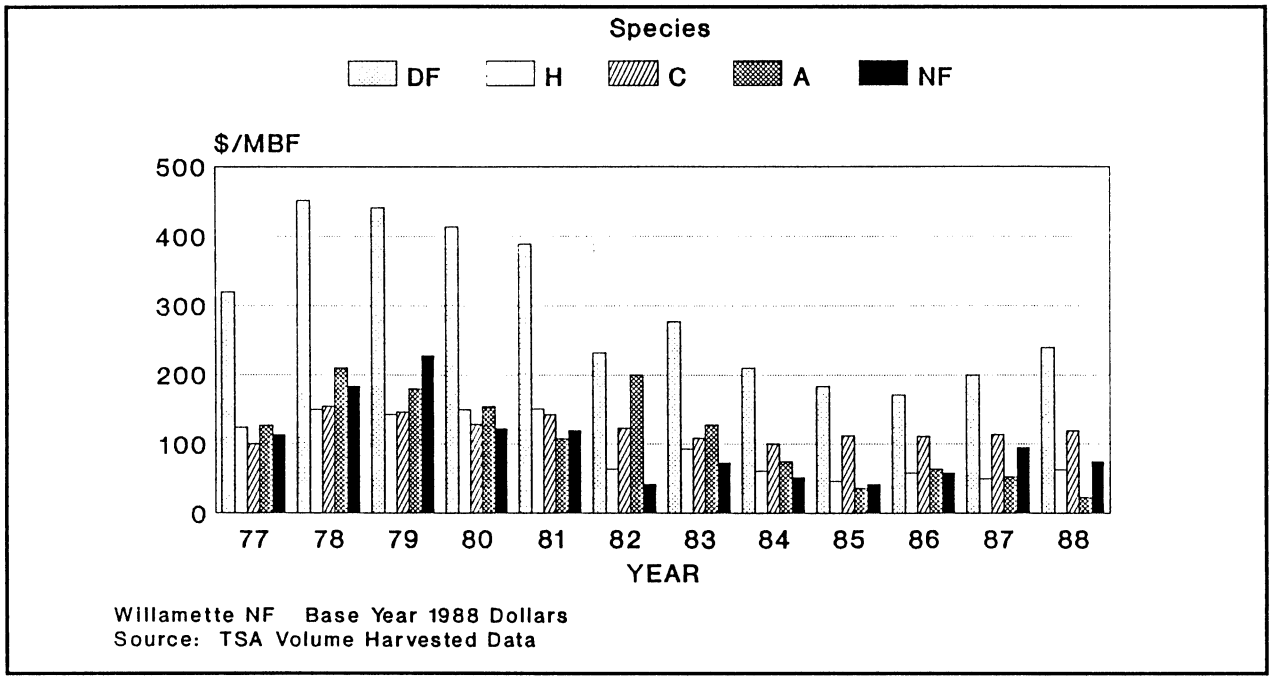


Figure B-3. Values of Species in True Fir

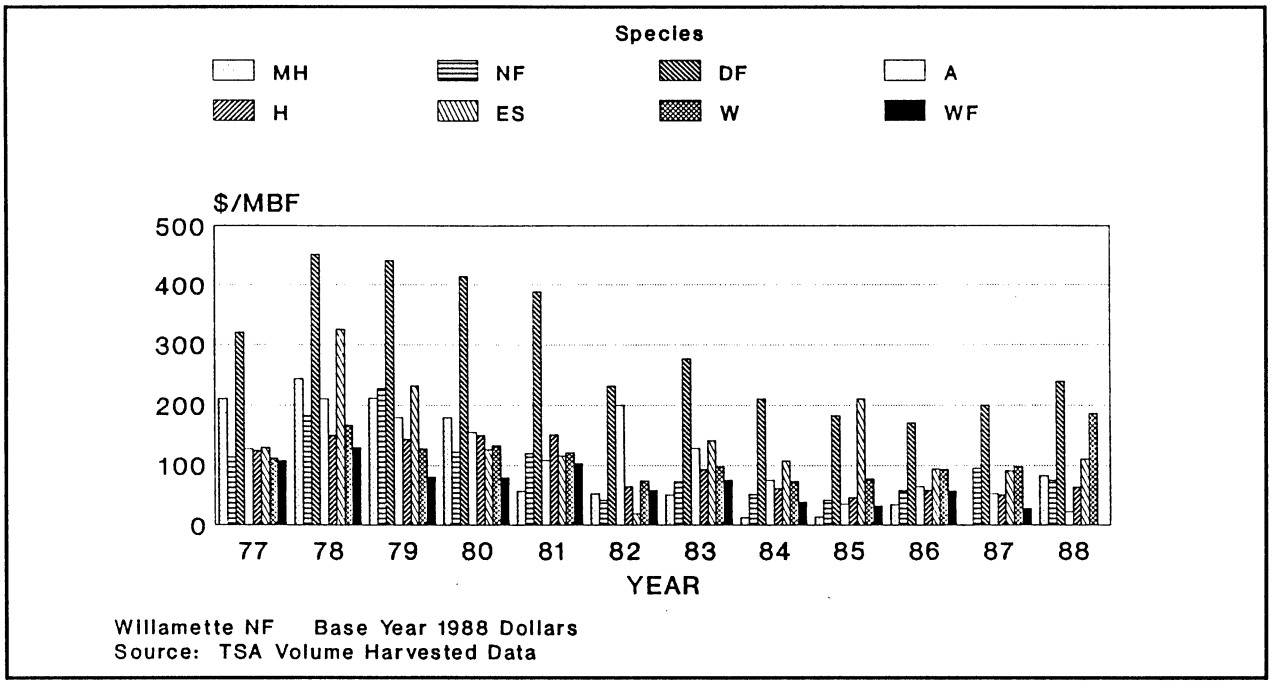


Figure B-4. Values of Species in Mountain Hemlock

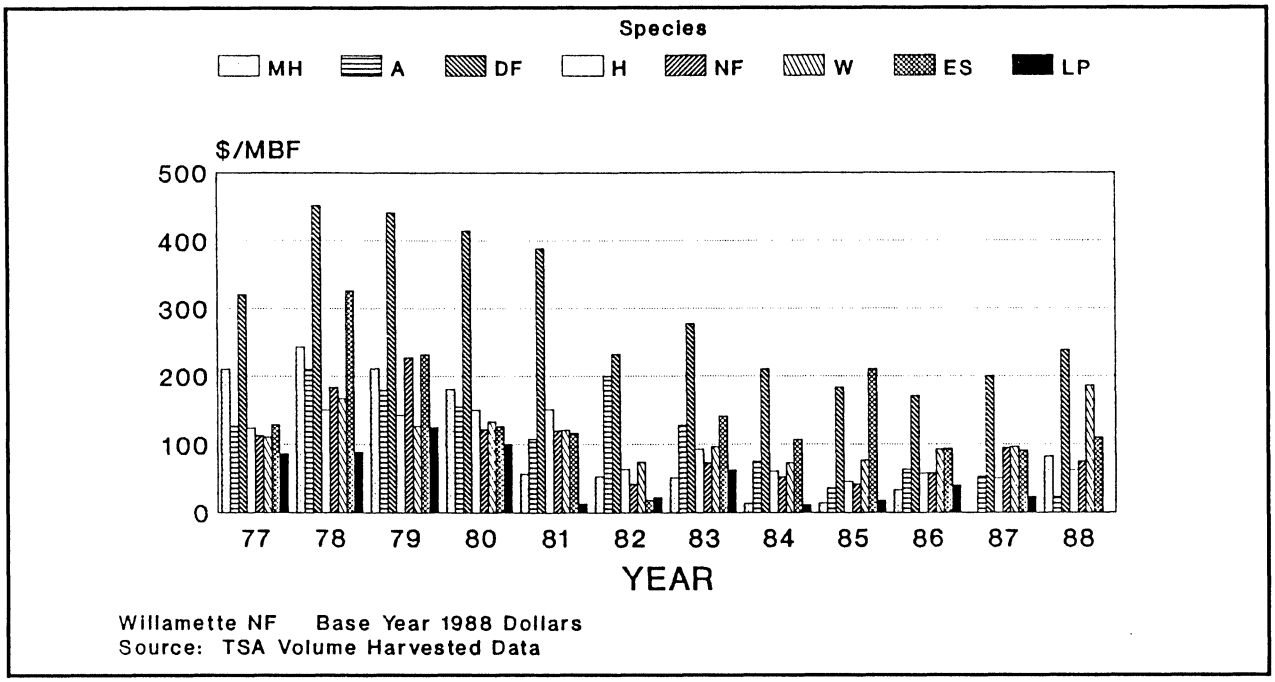


Table B-19. GNP Implicit Price Conversion Factors

Fiscal Year	Index
1982	100.00
1983	103.83
1984	106.88
1985	110.73
1986	113.84
1987	116.13
1988	119.94
1989	125.12
1990	130.12[1]

[1] Estimated by assuming 4% inflation for 1990.

Table B-20. Timber Type Values (Appendix B)

Timber Type	Species	Proportion of Volume	$/MBF	Composite Value
Douglas fir/western hemlock	Douglas fir	0.76	235.19	178.74
western hemlock	Western hemlock	0.16	82.57	13.21
	Western redcedar	0.04	99.25	3.97
	Pacific silver fir	0.02	95.08	1.90
	Noble fir	0.02	80.06	1.60

				199.43
Douglas fir/true fir	Douglas fir	0.55	235.19	129.35
	Western hemlock	0.16	82.57	13.21
	Pacific silver fir	0.11	95.08	10.46
	Noble fir	0.09	80.06	7.21
	Mountain hemlock	0.03	75.89	2.28
	White fir	0.03	80.06	2.40
	Western redcedar	0.02	99.25	1.98
	Western white pine	0.01	97.58	0.98

				167.87
True fir	Mountain hemlock	0.26	75.89	19.73
	Noble fir	0.24	80.06	19.22
	Douglas fir	0.16	235.19	37.63
	Pacific silver fir	0.16	95.08	15.21
	Western hemlock	0.13	82.57	10.73
	Engelmann spruce	0.02	116.76	2.34
	Western white pine	0.02	97.58	1.95
	White fir	0.01	80.06	0.80

				107.61
Mountain hemlock	Mountain hemlock	0.37	75.89	28.08
	Pacific silver fir	0.29	95.08	27.57
	Douglas fir	0.15	235.19	35.28
	Western hemlock	0.08	82.57	6.61
	Noble fir	0.07	80.06	5.60
	Western white pine	0.02	97.58	1.95
	Engelmann spruce	0.01	116.76	1.17
	Lodgepole pine	0.01	50.87	0.51

				106.77

Table B-21. Manufacturing Values $/MBF (Appendix B)

Timber Type	High Bid Stumpage	Average Logging Costs	Manufacturing Costs	Manufacturing Value
Douglas fir/Western hemlock	199.43	107.59	147.62	454.63
Douglas fir/True fir	167.87	107.59	147.62	423.07
True fir	107.61	107.59	147.62	362.82
Mountain hemlock	106.77	107.59	147.62	361.97

Note: Average Logging Cost and Manufacturing Cost are from 2400-17 Timber Data for the Forest, for the years 1984 to 1988.

Table B-22. Price-Diameter Indices

DBH	Douglas fir/ Western hemlock	Douglas fir/True fir	True fir	Mountain hemlock
8	64	59	73	79
10	68	64	77	89
12	73	69	81	96
14	77	73	84	100
16	81	78	87	
18	85	82	90	
20	88	86	92	
22	90	88	Avg.--> 94	
24	92	90	96	
26	93	92	98	
28	Avg.--> 93	93	99	
30	95	Avg.--> 94	100	
32	95	95		
34	95	95		
36	96	97		
38	98	99		
40	98	100		

Table B-23. Values by Timber Type

				Managed		Existing	
DBH	Index	Mfg. Value $/MBF	Pond Value $/MBF	BF/CF	Pond Value $/MCF	BF/CF	Pond Value $/MCF
Douglas fir/Western Hemlock							
8	64	313	165	2.34	387	4.22	697
10	68	332	185	2.34	432	5.02	928
12	73	357	209	3.30	690	5.02	1050
14	77	376	229	3.93	899	5.02	1149
16	81	396	248	4.54	1128	5.02	1247
18	85	416	268	4.64	1243	5.02	1345
20	88	430	283	4.87	1376	5.02	1418
22	90	440	292	5.16	1509	5.84	1707
24	92	450	302	5.16	1559	5.84	1764
26	93	455	307	5.49	1685	5.84	1793
28[1]	93	455	307	5.49	1685	5.84	1793
30	95	464	317	5.49	1739	5.84	1850
32	95	464	317	5.49	1739	5.84	1850
34	95	464	317	5.49	1739	5.84	1850
36	96	469	322	5.49	1766	5.84	1879
38	98	479	331	5.49	1820	5.84	1936
40 +	98	479	331	5.49	1820	5.84	1936
Douglas fir/True fir							
8	59	266	118	2.08	245	4.04	476
10	64	288	140	2.08	292	5.14	722
12	69	311	163	3.26	531	5.14	837
14	73	329	181	3.83	693	5.14	930
16	78	351	203	4.10	834	5.14	1046
18	82	369	221	4.47	990	5.14	1138
20	86	387	239	4.49	1075	5.14	1231
22	88	396	248	4.72	1173	5.72	1421
24	90	405	257	4.77	1228	5.72	1473
26	92	414	266	5.53	1473	5.72	1524
28	93	419	271	5.53	1498	5.72	1550
30[1]	94	423	275	5.53	1523	5.72	1576
32	95	428	280	5.53	1548	5.72	1601
34	95	428	280	5.53	1548	5.72	1601
36	97	437	289	5.53	1598	5.72	1653
38	99	446	298	5.53	1648	5.72	1704
40 +	100	450	302	5.53	1673	5.72	1730
True fir							
8	73	282	134	3.75	503	4.93	661
10	77	297	150	3.75	561	5.09	761
12	81	313	165	3.75	619	5.09	840
14	84	324	177	4.03	712	5.09	899
16	87	336	188	4.23	796	5.09	958
18	90	347	200	4.42	883	5.09	1017
20	92	355	207	4.63	961	5.09	1056
22[1]	94	363	215	4.89	1052	5.37	1156
24	96	371	223	5.03	1121	5.37	1197
26	98	378	231	5.10	1176	5.37	1239
28	99	382	234	5.26	1233	5.37	1259
30 +	100	386	238	5.45	1299	5.37	1280
Mountain hemlock							
8	79	286	138	3.92	542	4.35	602
10	89	322	175	3.92	684	4.99	871
12	96	347	200	3.92	784	4.99	997
14 +[1]	100	362	214	5.08	1089	4.99	1070

[1] These diameters represent the average value for each timber type.

Other Values That Generate Forest Revenues

The other values for which cash receipts are received are recreation special uses, recreation user fees, grazing, land uses, power, and minerals. The total returns for these values were averaged over the period 1985 to 1989. These receipts are a very small portion of the total returns to the Forest when compared to timber receipts. They also represent fairly stable uses and would not change significantly between alternatives. Therefore, the average values for these items were applied the same in all alternatives and benchmarks. The calculation of these values is displayed in Table B-24

Table B-24. Revenues Other Than Timber[1]

	1985	1986	1987	1988	1989	Average
Recreation Special Uses	65.93	145.12	159.99	178.84	178.47	145.67
Recreation User Fees	127.61	117.45	93.95	112.14	145.86	119.40
Other						
Grazing	0.36	0.44	0.43	0.42	0.56	0.44
Land Uses	16.17	16.78	18.08	15.01	17.58	16.72
Power	0.72	0.18	0.34	1.75	0.72	0.74
Minerals	32.87	11.86	3.27	5.42	8.15	12.32
Subtotal Other						30.22
GRAND TOTAL						295.29

[1] In thousands of base year 1982 dollars.

Other Nonmarket Values

In addition to the priced outputs for which actual cash revenues are received by the Forest, there are several forms of recreation that have values applied. The values used were developed for the Pacific Northwest Region for the 1985 RPA program analysis. No value was assigned to any recreation capacities which exceeded expected demand. The values used for each type of recreation are displayed in Table B-25.

Table B-25. Nonmarket Recreation Benefits

ROS Class		
Recreation Type	**Setting**	**Value $/RVD**
DEVELOPED	DEV	$9.38
DISPERSED	SPN	$13.25
	SPM	$12.13
	RN	$9.38
	RM	$4.97
WILDERNESS	PRS	$17.50
	PRM	$17.50
	SPR	$17.50
	TRN	$17.50

DEV Developed
SPN Semiprimitive Nonmotorized
RN Roaded Natural
RM Roaded Modified
PRS Pristine
PRM Primitive
SPR Semiprimitive
TRN Transition

Nonpriced Benefits

The calculation of PNV enables the comparison of alternatives with regards to their output levels for priced resources and their efficiency in producing them. However, other factors also influence the decision making process. In some cases the importance of nonpriced benefits for which it is impossible to assign monetary values can outweigh the advantages of producing higher levels of priced outputs. The importance of the need to consider these subjectively valued benefits in Forest management decision making is addressed in the NFMA Regulations which charge the Forest Service with identifying the Alternative which comes nearest to maximizing net public benefits (36 CFR 219.12(F)).

Net public benefits (NPB) represent the overall value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not (36 CFR 219.3). Net public benefits include both priced and nonpriced resource outputs, less all costs associated with managing the area. As stated earlier, all priced outputs and all costs associated with managing the Forest are included in the calculation of PNV. To this, the net subjective values of the nonpriced outputs must be added in order to arrive at the overall NPB of an Alternative. Some of the most important nonpriced benefits addressed during the Forest planning process revolve around maintaining and enhancing the following:

- Lifestyles
- Diversity and quality of recreation opportunities
- Ecosystem diversity
- Old-growth and snag habitat
- Scenic quality
- Historical and cultural resources
- Air quality.
- Water Quality

These are all outputs and effects which are influenced to a large degree by decisions regarding how to manage the Forest. They are important, but it is not possible to measure their importance in dollar terms which are comparable to market values. Their values must be subjectively determined.

The provision for many of the nonpriced benefits is achieved by applying constraints to the production of priced outputs (such as timber harvesting constraints in FORPLAN). These constraints usually result in a decrease in the PNV of the priced outputs to which the constraints were applied. Subjective judgements are then necessary in assessing whether the benefits of producing the nonpriced outputs exceed the opportunity costs associated with producing fewer priced outputs. If a PNV tradeoff induced by the provision of a nonpriced output is judged acceptable, then a positive contribution to NPB has resulted; and the alternative is overall more efficient.

While the quantitative dollar values of each nonpriced benefit can not be determined, they can generally be evaluated by examining such quantitative indicators as acres of appropriate allocations, resource inventories, or timber production related activities and outputs.

SOCIAL AND ECONOMIC IMPACT ANALYSIS

Social and economic impact analysis examines the consequences of different land management decisions on the people and communities surrounding the Forest. The effect of the alternatives on local communities are measured in terms of Forest Service payments to local governments, changes in job and personal income in the local area, and changes in lifestyles and community structure. Economic analysis identifies the consequences in terms of employment, personal income, and payments to counties while social analysis focuses on changes in lifestyles and community structure within the different types of communities surrounding the Forest. Both types of analysis focus primarily on the consequences in the 1st decade.

This section describes the data and methods used to estimate the social and economic effects of the benchmarks and alternatives. First, the relationships between the Forest and the local communities are briefly discussed and the area of influence is described. Then the methods used to estimate the impact on jobs and income are summarized. Finally, the framework of the social analysis is discussed. See the previous section of this Appendix for a discussion of the assumptions and methods used to estimate Forest Service payments to county governments.

This discussion is supported by other discussions of the FEIS: the community issue in Chapters I and Appendix A, the description and comparison of the alternatives in Chapter II, the socio-economic setting in Chapter III, and the consequences of the alternatives on local communities in Chapter IV. Much of following was drawn from the *Willamette National Forest Socio-Economic Overview* (Peterson, 1983) on file in the Supervisors Office in Eugene, Oregon.

Overview

Like neighbors of most National Forests, many residents and communities in the surrounding area are partially dependent on the resources of the Willamette National Forest for their social and economic well-being. The main ties to the Forest are 1) economic (primarily timber harvest), 2) use of Forest resources off the Forest (e.g., downstream use of water and viewing the Forest from major highways), and 3) recreation opportunities

Area of Influence

The area considered in these impact analyses is known as the primary area of influence. The Forest's area of influence is defined to include the people who utilize or are affected by its resources. The major resources of the Forest include recreation opportunities, fish and wildlife, timber, and water. Each resource is used, processed, or consumed by different, though overlapping, segments of the population located in varying proximity to the Forest. The primary area of influence for the Willamette National Forest consists of Lane, Linn, and Marion counties.

The secondary area of influence includes eight counties that surround or are influenced by the resources from the Willamette National Forest: Clatsop, Columbia, Multnomah, Jefferson, Benton, Polk, Yamhill, Douglas, and Deschutes. These and other counties are marginally influenced by the management of the Forest. This is apparent in terms of recreation visitors and indirectly through use of lumber products. The many lakes on the Forest, the migrating Chinook salmon and steelhead that spawn on the Forest streams, as well as the pristine Wildernesses, draw thousands of persons from the western states and other counties. The measurable influence that the Forest management alternatives have on these distant persons, counties, or states is, however, almost impossible to calculate.

The percentage of a county located inside the Forest indicates the effect the Forest has on these counties. Lane county has the highest percentage of its lands within the Forest boundary at 34.8%. Linn county follows very close with 31.7% of the county inside the Forest. Marion county, which has many small towns highly dependent on the wood and wood products manufacturing, has 18.1% of its land within the Forest boundaries.

Most of the timber sold on the Forest is processed at mills in Lane, Linn, and Marion counties. A small amount is processed in Douglas County. Historically, the Forest has provided anywhere from 18 to 40% of the logs processed at mills in the three-county area.

Economic Impact Model

An input-output model of the three-county area (the primary area of influence) was used to estimate the employment and income effects of Forest outputs and activities.

Input-output Overview

Input-output analysis is based upon the interdependence of the production and consumption sectors in an impact area. Industries must purchase goods and services from other industries as well as pay salaries to employees. Purchases include primary materials, like natural resources, used to manufacture outputs which are sold either to other industries or to final consumers. The model is a matrix representation of buyers and sellers in an economy. This matrix of input-output accounts can be thought of as a picture of an area's economic structure.

Flows of industrial inputs can be traced through the input-output model to show linkages between the industries present in the economy. These flows are transformed into a set of simultaneous equations that are used to predict economic effects resulting from changes in Forest outputs and activities. For example, changes in the level of timber outputs would cause a change in the timber industry (direct effect), which would affect construction and other industries that buy from and sell to the timber industry (indirect effect). In addition, changes in these industries would trigger changes in other industries, especially in the sectors which provide goods and services to the employees (induced effect).

IMPLAN Data Base

The input-output model used was IMPLAN, which was developed by the Forest Service from the 1972 National input-output model, updated in 1977, and again in 1982. The economic effects predicted by IMPLAN include employment, income, and population. More information is found in *IMPLAN Software Manual* (Alward, et al 1989) and *IMPLAN Analysis Guide* (Palmer, Siverts, and Sullivan 1985)

IMPLAN contains national economic data that has been organized into a single predictive model. The basis for prediction can be any single U.S. county or group of counties, any state or states, or the entire nation. Regardless of how the model is constructed (county or multiples of counties), IMPLAN provides a detailed description of the economy in question. The model then provides analytical information about the industries that are present and their relationship to other industries. Thus, changes in any of the industries as caused by the alternatives will result in measurable changes in the socioeconomic area of influence.

The economic effects estimated with IMPLAN are described by parameters typical of input/output studies. They are structural in nature, permitting multiplier effects to be traced throughout the various regional sectors. Direct, indirect, and induced changes in gross outputs, employment, income, and value added are the most representative parameters used to describe effects. When combined, the information provides a comprehensive account of potential regional economic effects. This information can be used to portray the Forest's relationship to the area economy and to help assess the effects on that economy of alternative management programs (USDA Forest Service 1985).

The IMPLAN model consists of: (1) a data base of economic information, (2) several computer programs designed to access the data base and construct a county or group of counties for analysis, and (3) an analysis program designed to show the differences in economic effects of the various alternatives and a projection of their effects.

Assumptions-The IMPLAN data base consists of two major components: (1) the national technology matrix, and (2) estimates of the economic sectors for final demand, final payments, gross outputs, and employment for each county in the United States. The data base represents 1982 county information for 528 economic sectors. The national technology matrix was derived from the 1977 Department of Commerce national input/output model. This matrix is a representation of the national averages that have been estimated at the state and county levels. Though the IMPLAN data base has been updated with 1982 information, it still reflects the earlier economic sector relationships.

The IMPLAN model is designed to compare the effects of changes in the final demand for particular goods and services upon a number of different sectors of the economy. It compares changes created initially in the sector receiving the change in final demand (direct effect), and the sectors influenced by changes in spending of the initially affected sector (indirect effect). The IMPLAN model uses a national transactions table to trace this movement of spending through the different sectors of the economy. It uses data developed in 1982 on these national transactions with data from Lane, Linn, and Marion counties for the same year. Thus, two assumptions inherent in the use of IMPLAN are

that the Forest's area of influence exchanges its goods in a manner similar to the national economy, and that the local economic relationships have not changed sufficiently since 1982 to invalidate the projected effects based upon 1982 data.

Several other critical assumptions are made with respect to the methods used to estimate values for the particular factors used in the analysis. Most of these factors rely on an assumption of adequate demand existing to fulfill the estimated use or consumption of the resource. Since adequate demand has not existed in the recent past for all of these items, most estimates have been labeled as "potential" effects. In the event that all demand and other related assumptions were met, these would become the actual impact. Demand assumptions were critical to the estimates of effects associated with timber harvests, payments to counties, and recreation.

Related assumptions deal with the financial estimates associated with these items. Changes in harvest levels and payments to counties rely upon the assumptions that demand will exist and that the stumpage will be cut with the resulting final products sold for the prices estimated. Changes associated with recreation activity assume not only that the recreation activities will actually occur as estimated, but that expenditures will be made as estimated. Changes in Federal expenditures assume that budget allocations will be made according to the estimates presented in the alternative.

Final Demand Expenditures

An intermediate step in estimating employment and income effects is to translate Forest outputs into final demand expenditures. Outputs on the Forest that can cause significant changes in final demand are timber, various forms of recreational activity, Federal expenses, and payments to counties. Final demand expenditures represent the money spent by the final consumers of the products derived from forest outputs. These expenditures are identified by the sector in which the expenditures occur. These data were all expressed in 1982 dollars to be consistent with the IMPLAN data.

Final demand values for timber were estimated based upon the selling values used for final timber products in the timber sale appraisal process. This value was identified as $453.82 per MBF in 1982 dollars appropriate for use in IMPLAN. This value reflects the product selling value after payments to the Federal Government are taken out. In theory this selling value would correspond to the change in final demand for timber.

Rather than attempting to separate the volume of timber from the Forest into the sawmill, veneer, and plywood sectors, these sectors were aggregated into a single sector. This sector receives the effects associated with changes in proposed harvest levels.

Another major category of Forest outputs influencing local economies are expenditures associated with recreation activities. A task force of economists in Region 6 developed a series of estimates of average expenditures associated with particular types of recreation activities. These major types of recreation activities were measured in terms of recreation visitor days (RVDs). For each activity category expenditures by specific IMPLAN sectors were estimated in 1982 dollars. Generally, each activity could be expected to divide its total expenditures among a number of different sectors. This would reflect expenses for food, gasoline, recreational equipment, etc.

To use these expenditures the Forest needed to estimate how much of its recreational use could be classified into each major group. From Recreation Information Management (RIM) records, an estimated percentage of total recreational use on the Forest was identified for each major activity group used in IMPLAN. From this point each alternative had its recreation use broken out by these percentages.

The resulting RVDs in each activity group used the appropriate final demand values and applied them to each individual sector.

The IMPLAN model was also used to trace the effects associated with changes in Federal expenditure levels and payments to counties associated with the alternatives. A first decade budget level for the Forest was established for each alternative as well as a historic budget level for purposes of comparison. Once the total budget level had been identified, the expenditures were divided into salary and nonsalary components. Recent information suggested that 56.3% of the total expenditures of the Forest were spent on salary related items.

A similar procedure was used to determine payment levels for counties. The actual calculation of payments to local governments (payments to counties) was calculated as 25% of most revenues received by the Forest. One-half of the reciepts from O&C lands are given to the counties but this only amounts to about 5% of the total payments to counties. The estimates of payments to counties were not adjusted to for any site specific activities on O&C lands.

The local county offices in the three-county area were contacted to determine how much of their budgets included payments from the Forest and based on their total budget what percentage was spent on salaries and nonsalary items. The county road departments receive 75% of the payments to counties and are production and maintenance oriented and spend approximately 72% of their budget on nonsalary items. Local schools received 25% of the payments to counties and being service oriented spend approximately 15% on nonsalary items. Payments from O&C receipts are not spent on any specific county budget items, but again, the payments make up such a small portion of the total payments to counties that no specific changes were made for payments from O&C lands.

For the salary component of Federal expenditures and payments to counties an additional adjustment was made to reflect the fact that the only part of salaries that influences local economies is that portion actually spent or invested locally. Amounts withheld for such deductions as Federal taxes, state taxes, and retirement are not spent locally. In 1982 approximately 33% of the total personal income was subsequently withheld in such a fashion. This percentage was applied to salary expenditures to reduce them to net salaries.

Once these payment levels had been identified and separated by salary and nonsalary components, the IMPLAN model was used to structure the nonsalary expenditures by the Forest to represent typical Federal expenditures. The nonsalary components of payments to counties were also modeled as typical expenditures for local governments.

Salary components from the Forest's budget and those payments to counties were combined and modeled as typical personal consumption expenditures.

Comparison of Alternatives

For purposes of comparing the alternatives, a base historical situation was defined reflecting estimates of the Forest's influence on the three county area for the past decade, 1980 through 1989. Estimates of timber quantity harvested, recreation activity, payments to counties, and expenditures by the Forest Service were made for this period. These were then compared to the results of the alternatives. Table B-26 lists the base historical levels used for these categories and the changes from the base level for each alternative.

Tables B-27 and B-28 summarize the quantifiable data associated with each alternative on employment and income. Table B-27 identifies the potential change in jobs for each alternative for the four major categories that were tracked. Table B-28 shows the total change in jobs and personal income for each alternative as contributed to by the direct, indirect, and induced change categories. These data all represent potential changes for the first decade relative to average conditions experienced over the 1980-1989 base period. Additional discussion of results can be found in Chapter 4 of the FEIS.

Table B-26. Base Historical Output Levels and Changes[1]

			Alternatives						
Outputs	**Units**	**Base**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Developed	MRVD	1,723.4	332.6	332.6	332.6	332.6	332.6	332.6	332.6
Semiprimitive Non-motorized	MRVD	59.4	-7.6	-50.7	-9.7	-5.4	-7.6	10.6	-7.3
Semiprimitive Motorized	MRVD	53.3	-3.4	10.7	-4.7	10.7	10.7	10.7	10.7
Roaded Natural	MRVD	1,056.8	-2.7	221.6	221.6	221.6	221.6	221.6	221.6
Roaded Modified	MRVD	311.7	64.8	64.8	64.8	64.8	64.8	64.8	64.8
Pristine	MRVD	14.0	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Primitive	MRVD	110.4	20.7	20.7	20.7	20.7	20.7	20.7	20.7
Semiprimitive	MRVD	116.5	-49.5	-28.1	-28.1	29.3	-10.6	-107.0	33.3
Transition	MRVD	54.6	11.4	11.4	11.4	-30.0	-32.5	-54.6	-31.6
Federal Expenditures[2] Salaries	MM$	14.58	13.17	9.04	9.37	5.12	3.97	4.14	-4.60
Federal Expenditures[2] Other	MM$	16.88	15.26	10.47	8.55	5.94	4.60	4.81	-5.33
Payments to Counties[2] Salaries	MM$	6.18	5.58	2.92	2.30	1.32	0.97	0.31	-3.90
Payments to Counties Education	MM$	0.82	0.74	0.39	0.30	0.18	0.13	0.04 -0.52	
Payments to Counties Noneducation	MM$	11.80	10.64	5.56	4.39	2.52	1.85	.60	-7.43
Timber Volume	MMBF	676	337	123	72	-24	-72	-90	-490

[1] The base level represents an average over the 1980-1989 period.
[2] In 1982 dollars for use in IMPLAN.

Table B-27. Job Changes from the Base Level by Output

		Alternatives						
Outputs	**Base[1]**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recreation Use	4,066	454	687	704	713	669	551	715
Federal Expenditures[2]	964	871	597	488	338	262	274	-304
Payments to Counties[2]	567	510	267	210	121	88	28	-357
Timber Volume	7,660	3,819	1,394	816	-272	-815	-1,020	-5,553
TOTAL	13,257	5,654	2,945	2,218	900	204	-167	-5,499

[1] The base level represents an average over the 1980-1989 period.
[2] In 1982 dollars for use in IMPLAN.

Table B-28. Changes in Jobs and Income by Category

		Alternatives						
	Base[1]	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Jobs								
Direct	6,931	2,869	1,600	1,246	614	272	77	-2,463
Indirect	2,568	1,182	511	345	31	-126	-196	-1,477
Induced	3,758	1,603	834	627	255	58	-48	-1,559
Total	13,257	5,654	2,945	2,218	900	204	-167	-5,499
Income								
Direct	156.8	72.4	35.7	26.0	8.6	-0.4	-4.8	-75.9
Indirect	93.5	44.9	18.2	11.7	-0.5	-6.6	-9.2	-59.6
Induced	90.0	38.4	20.0	15.0	6.2	1.4	-1.1	-37.3
Total	340.3	155.7	73.9	52.7	14.3	-5.6	-15.1	-172.8

[1] The base level represents an average over the 1977-1985 period.
[2] In 1977 dollars for use in IMPLAN.

Social Impact Assessment

The following describes the design of a system to analyze the qualitative and quantitative socioeconomic effects of alternatives displayed in the FEIS. Chapter IV shows the estimated effects of each alternative using the Socioeconomic Categories, Socioeconomic Measures, and planning issues tracked through the Socioeconomic Measures. These effects are also summarized in Chapter II.

A socioeconomic overview (SEO) for the Forest was completed in 1983 by a sociologist on the Forest Interdisciplinary Planning Team. The SEO analyzed a number of different social and economic aspects of the counties that surround the Forest. The SEO delineated three counties as being within the Forests primary area of influence: Lane, Linn, and Marion. The SEO also identified eight secondary counties that surround or are influenced by the resources from the Forest: Clatsop and Columbia Counties (anadromous fish), Multnomah (recreation), Yamhill, Benton, Douglas, Deschutes, and Jefferson Counties (recreation and some timber products). The effects estimation did not reference the secondary counties as the data were too difficult to quantify based on the differences between Forest outputs in the alternatives. The SEO went on to categorize several smaller rural communities within the primary counties that are dependent on Forest resources for basic employment and recreation needs: North

Santiam Canyon (Marion and Linn Counties), Sweet Home and Eastern Linn County, McKenzie River Valley (Lane County), and the Oakridge-Westfir Area (Lane County).

In addition, the SEO identified the major community lifestyles that are tied to employment: agriculture, lumber and wood products, other manufacturing, and nonmanufacturing/service (including government). These employment sectors served as a socioeconomic category indicator for this analysis. This category is strongly related to the changes in jobs that are predicted by alternative. Employment changes most with the level of timber harvest, and somewhat to the recreation opportunities, both on and off the Forest. The largest effect is simply the opportunity for employment and whether the job is a higher income industrial or forestry job as opposed to an entry or lower paying service sector job. This tends to have effects on the total amount of persons moving to or from an area, but it can be offset by family ties, desirability of the area for living/working, unemployment insurance, and prospects for other employment.

There are various government bodies and social organizations within the area of influence. However, the effects of implementing each alternative were only estimated for the county governments (revenues and taxes). Estimates of the effects on city governments, as well as the various social groups, were considered too difficult to estimate and highly variable due to circumstances beyond the control of actions proposed through the FEIS.

There are qualitative judgements about the expected degree of social cohesion/polarization that is likely to occur for each alternative due to different types of management of areas on the Forest. Social cohesion (sometimes referred to as social acceptance/rejection) concerns the allocation of, or management of, scarce natural resources by the Forest. Varying the acres or areas of roadless lands, spotted owl habitat, old-growth, and timber management (including harvest levels) are the major controversial points (polarization) of this socioeconomic indicator, as qualitatively measured through coverage by regional and local newspapers, magazines, TV and radio broadcasts, as well as professional judgement.

Several other social categories were considered, but not in detail, for the Forest alternatives. The first was the potentially affected minority groups within the primary counties, including Black, American Indian, Hispanics, and others. Logical suggests that some indirect effects will occur to the minority groups; however, they are practically impossible to estimate as the alternatives are constructed. Forces external to the planning process, such as changes in EEO or Civil Rights laws or procedures, as well as Immigration and Naturalization Service policies, should have greater effects on minorities than any of the proposed alternatives.

A socioeconomic category was considered for population growth within the area of influence. The individual tendencies for people to move or stay will be little influenced by Forest alternatives. Thus, it is expected that Forest management will have little effect on population growth, especially in Lane County. Population changes in the primary zone of influence may be indirectly affected by employment changes by alternative, but the overall population change still depends on choices of the individual or family. Even when lumber and wood products employment was down during the last decade, workers stayed in their communities, often relying on unemployment insurance, spouse employment, savings, etc. Some changed occupations, while many others waited for the economy to pick up and the mills to reopen.

A socioeconomic category of attitudes, beliefs, and values was considered but also rejected. As these components of the socioeconomic environment are generally reflected in each person rather than a group or society, it is difficult to measure the effect of each alternative on such a category. As with population growth, a person's attitudes, beliefs, and values tend to be influenced more by the person,

family, and social groups and organizations (reference groups) than by changes between alternatives. As a consequence, the Forest could not estimate the differences between alternatives for this category.

Lastly, a potential socioeconomic category, that of land ownership and land use patterns off-Forest by alternative, was also rejected. This category was not considered because the planning group felt that the alternatives would have no effect on this measure. The Forest will coordinate with the concerned counties to make sure that the State Land Conservation and Development Commission (LCDC) zoning of Forest lands remains compatible. Land exchanges will remain at a low level.

For the purpose of estimating the socioeconomic effects of alternatives, the members of the Forest Planning Team identified employment, payments to the counties, lifestyles, and community cohesion as social categories to be used in assessing the effects of the alternatives on communities.

With the socioeconomic categories established above, qualitative socioeconomic measures were identified for estimating effects of the Forest alternatives in the FEIS. The following defines the socioeconomic measures used:

- EMPLOYMENT DISTRIBUTION - This item measures job shifts including increases and decreases, changes in the types of jobs - skilled/unskilled, full-time/part-time/seasonal differences, pay differentials - high pay/low pay work, etc.

- LIFESTYLE - This item measures the use of the National Forest for such activities as firewood cutting, hiking, camping, cross country skiing, hunting, fishing, off-road vehicle use, visual quality, ect. Negative effects on lifestyles occur when actions reduce employment opportunities, decrease use of the Forest for subsistence and recreation, and lower the environmental quality of the area.

- COMMUNITY COHESION AND POLARIZATION - This item measures the degree of unity and cooperation among various segments of a community in realizing mutual goals or solving problems. The degree of acceptance or rejection of Forest management practices, division between the Forest Service personnel and local groups, the agreement or polarization between groups, etc. are variables in the analysis of the effects of Forest actions. The Forest's public issues are one way to track this measure.

- EXPECTATIONS OF STABILITY OR CHANGE - This item measures the ability to handle change (resistance or acceptance), rate and amount of expected change, traditional ways of doing things, uncertainty of the future (especially employment), reactions to newcomers, etc. This measure can also be tracked through public issues.

- JOBS - This item measures the IMPLAN estimated job losses/gains or shifts within the primary area of influence.

- INCOME - This item measures the IMPLAN estimated flow of personal income, or differences in the amount of income, or shifts within the area of influence.

- REVENUES - This item measures the estimated federal revenues (generated from FORPLAN) that should be returned to the U.S. Treasury and the county governments from timber receipts and user fees (usually recreation). At the county level, these monies are earmarked for use for schools and roads for 25% fund receipts, but the O&C revenues go to counties to be spent however they wish.

ANALYSIS PRIOR TO THE DEVELOPMENT OF ALTERNATIVES

Introduction

The primary analysis prior to the development of alternatives was the Analysis of the Management Situation (AMS). Other analyses pertinent to development of the FORPLAN model are described in Section C of this Appendix. A comprehensive analysis of resource and economic production capabilities is required in the Analysis of the Management Situation. This was accomplished through FORPLAN computer runs known as benchmarks. The purpose of benchmark analyses was to provide information on:

- The implications of complying with legal policy constraints, including minimum management requirements of 36 CFR 219.27.
- The effects of economic and other modeling assumptions.
- The schedule of management activities, resource outputs, effects, costs and present net value (PNV) associated with a single resource or an economic emphasis of individual benchmarks.
- The potential to resolve issues and concerns.
- The need to change current management direction.
- The range within which integrated alternatives could be developed.

All benchmarks which were developed in this analysis are designed to be approximately implementable and are not constrained by budgets (except for the No Action Benchmark).

A maximum PNV objective function is generally used to obtain a final analytical solution in FORPLAN. The required benchmarks for the Forest are:

- No Action.
- Minimum level.
- Maximum present net value including assigned values.
- Maximum present net value with market values only.
- Maximum resource levels.

Individual resource benchmarks were developed for timber and recreation. Many variations of these economic and resource benchmarks were run to assess the opportunity costs and resource tradeoffs associated with meeting specific objectives, regulations, policies and assumptions. These analyses are discussed in the following sections. For the FEIS both the maximum present net value and the maximum timber benchmarks have been re-calculated. Please review the discussion of these benchmarks to gain an understanding of how FEIS modeling changes have affected the Management Situation.

Development of Management Requirements

Development and Analysis

Management requirements (MRs) assure that a viable level of resources will be provided over the length of the planning horizon. These requirements stem from the National Forest Management Act as interpreted by its implementing regulations (36 CFR 219.27).

Additional direction for developing these requirements was provided the Forest in the form of *Regional Guidelines for Incorporating Minimum Management Requirements in Forest Planning* (1920 2/9/83).

These guidelines established the Regional interpretation of the requirements. The management requirements described in the Regional Guidelines deal with:

- Requirements that are outside the Forest Service's authority to change.
- Requirements which impose substantive standards (as opposed to procedural).
- Requirements that can be dealt with in the analysis.
- Requirements which are likely to have an impact on analysis.

Specific MMRs applicable to the Forest are presented in Table B-29. Of the requirements listed, it was necessary for the Forest to evaluate and select appropriate modeling techniques for the following:

- Old-growth/mature habitat for the spotted owl, pileated woodpecker, and marten.
- Riparian areas.
- Snags.
- Harvest dispersion.
- Soil and water conservation.

For old-growth and mature habitat, Regional planning direction (1920, 11/10/83) states that this assessment can take a variety of forms including "1) Use mapping systems and logic to distribute the species in a way that minimizes the impact on the commercial forest land base, but still achieves the distributional requirements of the species; or 2) Conduct Regional analysis to determine whether set asides or long rotations are least impactful..."

The Forest developed a management requirement spotted owl distribution from an inventory of 219 verified pairs, following the guidelines of the *Final Supplemental EIS for Spotted Owls for Amendment to the Pacific Northwest Regional Guide*, 1989. Pileated woodpecker and marten areas were added to complete the habitat network. While there was little flexibility left given the distributional requirements, logic was applied to minimize impacts to the suitable timber land base while still providing appropriate habitat conditions. Examples of this logic include placement of marten and pileated woodpecker areas in designated Wilderness areas, RNAs and, lands unsuited for timber management.

An analysis of habitat management versus habitat dedication was completed for those areas predominantly occurring on suited lands. Analysis of spotted owl habitat areas on a per acre basis outside of FORPLAN revealed a significant timber falldown under management due to the length of time required for stands to develop old-growth characteristics. This analysis entailed development of a "managed" silvicultural prescription to provide spotted owl habitat, setting the rotation length and habitat area size, and comparing the resultant outputs to dedication of 1,500 acres per spotted owl pair. The procedure followed was to calculate the resultant difference in mean annual increment (MAI) and present net value (PNV) per acre and sum the differences on a Forest-wide basis.

Table B-29. Management Requirements for the Willamette National Forest

Resource/Requirement	Specifics
Timber	
Reforestation within 5 years of harvest	Created opening = 4 1/2 feet tall; maximum harvest rate/decade = 30 %
Nondeclining yield (unless departure requirements are met).	
Harvest unit size restrictions by ecological zone (40-60 acres).	
Perpetual timber harvest.	
Rotations set at 95% CMAI or later.	
Harvest dispersion standards.	
Wildlife	
Maintain sustaining habitat for all management indicator species.	Primary cavity excavators; 20% of biological potential. Spotted owl; 78,000 acres. Pileated woodpecker; 12,300 acres. Pine marten; 21,120 acres. Bald eagle; 1,080 acres. Fish; see riparian areas. Peregrine falcon; maintain 12 sites.
Provide additional protection for special habitats and sensitive species not selected as management indicators through Forest-wide standards and guidelines.	Dead and down woody debris, cliffs, caves, talus, natural openings, and meadows. Sensitive plants, western spotted frog, Townsend's big-eared bat, Oregon chub, and wolverine.
Soil, Water, and Riparian Areas	
Harvest dispersion constraint for riparian areas.	Class I -- 5% harvest rate/decade. Class II -- 5% harvest rate/decade. Class III -- 6.7% harvest rate/decade. Lakes -- 6.7-10% harvest rate/decade.
No timber harvest flood plain, wetland, soil and water resource protection areas.	21.5% of riparian areas.
Miscellaneous	
Developed recreation sites managed by the Forest Service which receive use in excess of 60% of theoretical capacity, or are located in the Oregon Cascades Recreation Area (OCRA).	17 sites on 341 acres.
Stipulated mining claims	128 acres.

Marten and pileated woodpecker areas were evaluated outside of FORPLAN using the same technique. Preliminary results indicated that a managed approach was slightly more efficient from a PNV and timber volume standpoint. This analysis was based on the following criteria:

Species	Approximate Size of Habitat Area	Timber Type	Rotation Length
Marten	450 Acres	Douglas-fir/Western hemlock	150
		Douglas-fir/True fir	170
		True fir	180
		Mountain hemlock	200
Pileated Woodpecker	1,000 Acres	Douglas-fir/Western hemlock	140
		Douglas-fir/True fir	150
		True fir	170

Additional analysis in FORPLAN indicated that the difference in PNV and first decade Allowable Sale Quantity (ASQ) between the managed and dedicated approach for marten and pileated woodpecker were insignificant on a Forest-wide basis (less than 0.1% difference). Thus, the Forest selected a dedicated approach for spotted owl, marten, and pileated woodpecker habitat in the DEIS and based on public comment used both approaches for marten and pileated woodpecker in the FEIS.

MRs for riparian areas, and for soil and water are linked together: practices affecting soil and water in the upland areas affect riparian areas, and practices in riparian areas affect soil and water conditions. Several alternative methods of meeting these requirements were considered including selection of a riparian indicator species. Two of the more direct methods involved dedicating riparian areas to nontimber harvest prescriptions and placing rate of cut constraints on watersheds. These two methods would most directly ensure meeting MRs but would also have the greatest impact on timber harvest and, therefore, the most effect on PNV. The IDT thus sought to find alternative standards and guidelines that would meet requirements but have less impact on PNV. The selected approach relies on a mix of practices and project level standards and guidelines, as well as full protection restrictions on potentially unstable streambanks, and rate of harvest constraints within Class I, II, III, and lake riparian areas. This combination requires the minimum trade-offs necessary to ensure meeting riparian requirements.

Harvest dispersion constraints are also explicitly portrayed in the Willamette FORPLAN model. Following the two-step process outlined in the Regional planning direction (1920 11/10/83), a theoretical dispersion factor was calculated. This factor was modified after intensive mapping exercises demonstrated that slightly higher percentages could be harvested and still meet dispersion requirements. The application of the dispersion factor was adjusted to fit the modeling changes that occurred for the FEIS.

MRs for the provision of snags outside of areas dedicated to old growth management require snags at least 18 inches in diameter for some primary cavity excavators (Forest Planning process paper: Dead and Defective Tree Habitat). DEIS benchmark analysis showed that 12 inch trees could be provided through normal mortality without additional constraints or allocations to meet this requirement. For the FEIS each harvest unit is required to maintain the 18 inch snags over time, with up to 2% change in the harvestable volume on every acre.

The evaluation outlined above resulted in the selection of techniques which best satisfied on-the-ground management and economic efficiency criteria. The selected methods have been incorporated into the Forest FORPLAN model. Appendix H of the DEIS describes the development of MRs in more detail.

Impacts and Effects

Several FORPLAN runs were made with different MR constraints present so that the effects of MRs could be determined. All of these runs used the maximum PNV benchmark as a base against which to make comparisons. This run maximized PNV subject to all MRs. The runs used for comparison differ from this run only in the absence of constraints designed to meet one or more MR. Table B-30 shows the results of these runs. Appendix H of the Draft EIS describes the impacts of MRs in more detail.

Table B-30. Management Requirements - Effects on PNV and Timber Harvest

	LTSY [1]		1st Decade ASQ [1]		PNV [1]		
Description	MMCF	Percent Change	MMCF	Percent Change	$MM	Percent Change	Comments
Maximum PNV W/ all MRs	120.2	--	117.3	--	$3,782	--	This benchmark is the basis for comparison.
Dispersion MR	120.4	(+0.2)	119.0	(1.4)	$3,994	(5.6)	Not modeling dispersion allows harvest rates to exceed 25%-30% of a watershed per decade.
Mature Timber	123.0	(+2.3)	120.5	(2.7)	$3,908	(3.3)	Not modeling this MR adds 18,880 acres to timber production.
Riparian MR	124.0	(+3.2)	121.7	(1.2)	$3,901	(3.1)	Removing this MR adds 11,123 no harvest and 42,742 reduced harvest acres into full yield timber harvest.
Spotted Owl	130.2	(+8.3)	128.2	(9.3)	$4,237	(12.0)	Not modeling this MR adds 70,339 acres to timber production.
TOTAL		(14.0)		(14.6)		(24.0)	
Maximum PNV without MRs[2]	132.5	(N/A)	129.6	(N/A)	$6,073	(N/A)	This data is included as a reference to the DEIS. The percent change information is not valid because many coefficients have changed between the DEIS and FEIS.

[1] These effects are maximum estimates based on benchmarks. Actual opportunity costs are less when MRs are needed in part or totally to meet a resource objective in one or more of the alternatives.

[2] The maximum PNV without MRs benchmark was not re-calculated using FORPLAN. The information used here is from the DEIS.

As you look at Table B-30 you will note that the effects of managing for the Spotted Owl under SEIS guidelines is as much or more than all of the other MRs put together. For each of the MRs the effect on PNV is generally a function of Douglas fir old growth harvests and the effect on timber is a function of Douglas fir small sawlog or medium sawlog harvest. Also the reader may note that the total timber difference (maximum PNV without any MRs) does not equal the sum of the MR effects. This discrepancy is due to the overlapping nature of the requirements (i.e. riparian areas that exist within spotted owl habitat areas). The reader should not attempt to compare PNVs for the maximum PNV without MRs and the maximum PNV with MRs. The maximum PNV without MRs data was generated using DEIS data and assumptions while the maximum PNV with MRs used updated FEIS data.

Benchmark Formulations

The role of benchmark analysis in the AMS is specified in 36 CFR 219.12(e). Benchmark analysis serves a variety of purposes, including:

- Defining the range within which alternatives can be constructed.
- Defining the maximum economic and biological resource production potentials.
- Estimating the mix of resource uses, as well as a schedule of outputs and costs, associated with the objectives of each benchmark.
- Analyzing the potential to resolve issues and concerns.
- Analyzing the implications of continuing current management direction and whether a need to change current direction exists.
- Analyzing the implications of existing laws and policies.
- Analyzing the implications of economic assumptions.
- Evaluating the complimentary and conflicting production relationships between the goods and services provided by the Forest.

For the FEIS, the No Action (Alternative A), maximum PNV and maximum timber Benchmarks have been re-calculated. These results are displayed side-by-side with the DEIS benchmarks to help the reader understand the effects of the numerous changes in data and assumptions that are used in the FEIS. The analysis was documented in the *Transition Analysis* (Scanlon, 1989) and the *MR Results* (Scanlon, 1989) which can be found in the planning records at the Forest Supervisor's Office. A discussion of the purpose and objectives for each benchmark follows Tables B-31 and B-32 which contain the allocation and output summaries for the benchmarks. Unless stated otherwise, each benchmark that harvests timber will meet the following requirements:

- Timber harvest is scheduled only on lands classified as "available and suitable" for timber management.
- Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).
- Timber harvest cannot exceed the long-term sustained yield capacity in any decade.
- Regeneration cuts cannot be scheduled until stands have reached 95% CMAI
- An objective function of "maximize PNV" is used. Both market values and assigned values are included in the calculation of PNV.
- MRs are met or exceeded.

- Sufficient timber inventory must remain at the end of the modeling horizon to sustain timber harvests that occur at the end of the modeling horizon.
- Developed recreation sites which currently exceed 60 % of their theoretical capacity are not available for timber management.

Minimum Level

The minimum level benchmark determines the costs necessary to retain National Forest Lands in federal ownership. Minimum environmental constraints and protection of the life, health, and safety of users must be provided.

The purpose of developing the minimum level benchmark is:

- To determine the minimum costs involved with maintaining National Forest lands in the National Forest system; i.e., a cost level that is not discretionary in the Programming and Budgeting process within the direction provided.
- To determine the pertinent outputs and effects related to this "minimum expenditure" level.

Those assumptions and constraints necessary to the benchmark formulation with significant bearing on costs, outputs, and effects estimation are listed below:

- Practices and costs are only those necessary to keep the Forest in public ownership under the assumptions noted below.
- Some costs are necessary including those to protect the life, health, and safety of incidental users; to prevent environmental damage to lands or resources of adjoining ownerships; and to administer unavoidable special uses.
- Significant impairment of the productivity of the land is not allowed.
- Outputs associated with this benchmark include only significant and uncontrollable outputs and uses such as water yield, sediment, wildlife, fisheries, and incidental recreation use.
- A "no harvest" prescription is applied to all analysis areas; timber sales have been completed or terminated.
- Costs for a transition "close down," necessary if this benchmark were to be implemented, were not included as per Regional direction.
- Developed recreation sites and special uses would be closed or terminated.
- Trail system would be reduced by eliminating those trails maintained at Levels 1 and 5. National trails would be maintained at Level 2 with all remaining trails not eliminated at Level 1.

- Grazing would be discontinued.
- Unavoidable non-Forest Service special uses and developments related to private mineral rights would be allowed.
- The road system would be reduced and maintained at a minimum safety level.
- Fire, administrative, and other facilities would be maintained at the needed level.
- Fish and wildlife habitat improvements necessary to prevent adverse impacts to threatened and endangered species and to prevent conditions from developing which would create a nonviable situation for existing native species.

Table B-31. Benchmark Allocation Acres

Management Strategy	Min Level	No Action		Max PNV		Max Timber		Max Recreation
		DEIS	FEIS	DEIS	FEIS	DEIS	FEIS	
General Forest (GF)[1]	0	1,019,162	874,271	1,262,821	918,807	1,264,677	927,942	0
No Harvest (GF)[1]	0	0	164,137	0	343,225	0	334,090	0
Dispersed Recreation	6,122	96,258	85,277	6,122	6,122	6,122	6,122	284,222
Wild and Scenic Rivers	0	0	14,462	0	0	0	0	5,035
Scenic Resource (Visuals)	0	146,792	118,723	0	0	0	0	960,830
Old-Growth Groves	0	2,721	2,730	0	0	0	0	2,264
Wilderness [2]	380,890	380,890	386,863	380,890	380,890	380,890	380,890	386,906
Special Interest Areas	1,813	1,813	1,109	0	0	0	0	6,570
Research Natural Areas	2,197	4,245	2,197	2,197	2,197	2,197	2,197	2,197
Experimental Forest	15,379	15,379	15,379	15,379	15,379	15,379	15,379	15,379
Developed Recreation	0	3,754	4,330	3,605	4,330	1,749	4,330	3,754
Land Uses	0	4,479	4,543	4,479	4,543	4,479	4,543	4,479
Special Wildlife Habitat	0	0	1,472	0	0	0	0	4,521

[1] Includes all acres not available (including roads, MRs, nonforest, unsuited).
[2] Includes Oregon Cascades Recreation Area (OCRA) - 6,122 acres.

No Action

This benchmark provides for management of the Forest using the current Forest Plan, as adjusted to incorporate changes since 1977, including MRs for various resources. Some of these changes have occurred since the DEIS was written. Data from the DEIS is displayed along with the FEIS No Action Alternative so that the reader can review the effects of changes that have occurred since the DEIS. These changes are listed in the *Introduction* to Appendix B and briefly listed in the *Introduction* to Chapter II.

This benchmark provides for a wide range of multiple uses through the allocation of land for developed and dispersed recreation, scenic quality, special interest areas, education and research, fish and wildlife, water, wilderness,and wood products. Forest management under the current plan continues to emphasize scenic quality in major Forest viewsheds, dispersed recreation primarily at higher elevations,and timber harvest from the Forest's most productive lands.

This benchmark estimates the capability of the planning area to provide a wide range of goods, services, and uses from present land allocations, and the consequent costs, benefits, and outputs, through the application of management prescriptions.

Pertinent assumptions and constraints in addition to those listed for all benchmarks include:

- Management allocations from the 1977 Willamette National Forest Land Management Plan are assigned the appropriate prescription.
- Harvest accessibility will be deferred in areas where existing conditions are inconsistent with prescription standards.
- Current budgetary levels are used.

Table B-32. Outputs, Effects, Activities, and Costs for the Benchmarks

Output, Effect, Activity or Cost	Units	Min Level	No Action		Max PNV (Assigned)		Max Timber		Max Recreation
		DEIS	DEIS	FEIS	DEIS	FEIS	DEIS	FEIS	DEIS
Developed Recreation Use	MRVDs	0	1,625	2,056	1,774	2,056	1,002	2,056	1,877
Nonwilderness Dispersed Recreation Use									
Semiprimitive Nonmotorized Use	MRVDs	88	28	50	1	0	1	0	58
Semiprimitive Motorized Use	MRVDs	70	39	49	7	13	7	13	62
Roaded Natural Use	MRVDs	147	300	1,278	1	0	1	0	686
Roaded Modified Use	MRVDs	254	442	376	753	2,142	755	2,142	340
Wilderness Recreation Use	MRVDs	126	267	352	255	369	255	369	246
Visual Quality Objectives									
Preservation	M Acres	774	449	547	389	389	389	389	686
Retention	M Acres	308	85	78	0	0	0	0	402
Partial Retention	M Acres	222	101	150	4	4	2	2	4
Modification	M Acres	402	0	5	0	0	0	0	565
Maximum Modification	M Acres	0	1,035	895	1,283	1,283	1,285	1,285	15
Spotted Owl Habitat Areas	Number	152	87	59	78	59	78	59	78
Pileated Woodpeckers (Unique Sites)	Number	41	128	156	41	156	41	156	41
Pine Marten (Unique Sites)	Number	132	347	256	132	256	132	256	132
Big-Game Use	MWFUDs	32	41	NE[1]	71	NE[1]	71	NE[1]	44
Other Wildlife Use	MWFUDs	27	38	NE[1]	64	NE[1]	64	NE[1]	71
Anadromous Fish Use	MWFUDs	61	87	NE[1]	108	NE[1]	109	NE[1]	140
Resident Fish Use	MWFUDs	54	93	NE[1]	111	NE[1]	111	NE[1]	119
Allowable Sale Quantity	MMBF	0	611	748	660	667	663	654	102
Allowable Sale Quantity	MMCF	0	107	135	113	117	117	118	18
Fuelwood	M Cords	0	54	54	60	59	61	59	10
Reforestation	M Acres	0	11.3	12.1	11.9	13.1	13.9	13.2	2.1
Timber Stand Improvement	M Acres	0	5.2	20.7	4.1	NE	4.2	NE	2.6
Long-Term Sustained Yield	MMCF	0	116.7	113.5	123.1	120.2	123.3	126.4	88.3
Total Budget	Million $	3.7	46.5	58.2	40.7	60.9	40.4	63.4	9.5
Returns to Government	Million $	0	120.9	119.9	130.0	146.4	131.0	134.6	20.2
Payments to Counties	Million $	0	30.2	30.0	32.6	36.6	32.7	33.6	5.1
Changes in Jobs	Number	NE	1,412	2,219	1,072	NE	1,110	NE	-4,234
Changes in Income	Million $	NE	34.7	52.7	32.4	NE	33.2	NE	-94.1
Area Available for Specific Resource Uses									
Timber Harvest	M Acres	0	906	NE	937	NE	937	NE	759
Mineral Exploration	M Acres	1,236	1,128	NE	1,228	NE	1,229	NE	1,222
Present Net Value	Billion $	0.86	4.55	3.18	4.58	3.78	4.87	3.48	2.72
Discounted Benefits	Billion $	1.13	8.33	6.36	8.26	7.15	8.82	7.07	4.63
Discounted Costs	Billion $	0.27	3.78	3.18	3.68	3.36	3.95	3.60	1.91

[1] NE = Not Estimated

Maximum Present Net Value

The purpose of these benchmarks is to estimate the mix of resource uses, combined with a schedule of outputs and costs, which maximizes the present net value of Forest outputs. The maximum Present Net Value (PNV) benchmark can be calculated on just those commodities which are traded in established markets (i.e. timber, range forage, commercial fish, developed recreation, and minerals) or on *market values* plus *assigned values*. Assigned values are values which are estimated for outputs which do not have established market prices (i.e. dispersed recreation, wilderness recreation, fish and wildlife, and water use).

Market and Nonmarket Output Relationships - Prior to formulation of the benchmarks for the AMS, an analysis was conducted to see if nontimber prescriptions could compete with timber prescriptions in terms of PNV when recreation values were considered. A preliminary analysis of nontimber prescriptions was conducted outside of FORPLAN to determine if they could compete with timber on a per acre basis. Dispersed recreation and scenic resource prescriptions were analyzed and compared to timber prescriptions. This analysis showed that when an existing stand could not be harvested immediately, the higher recreation values enabled a number of these nontimber prescriptions to be economically competitive. To determine if this would still hold true on a Forest-wide basis when future stand growth considerations enter into the analysis, a FORPLAN run was made which included the most competitive of the nontimber prescriptions. Approximately 920 acres went to a scenic prescription in this run. The rest of the land base all went to timber harvest prescriptions (approximately 950,000 acres).

The main reason nontimber prescriptions cannot compete with timber harvest prescriptions is that producing additional recreational benefits involves a reduction in the harvest rate of existing high valued timber stands. Additional costs are also a handicap for the nontimber prescriptions. Since less than 0.1 percent of the suitable timber acres went to nontimber prescriptions in the analysis, nontimber prescriptions were dropped from further consideration when PNV was the sole objective. The only difference between the benchmarks for maximum PNV with market values only and maximum PNV with market values and assigned values is that the assigned values are included in the calculation of discounted benefits and present net value with the assigned value benchmark, but not the market value only benchmark.

The FEIS comparison displayed in Table B-32 shows the sensitivity of Forest-wide solutions to changes in the values and assumptions between the DEIS and FEIS. Only those assumptions and constraints listed for all benchmarks are pertinent to the PNV benchmarks.

Maximum Timber

This benchmark estimates the highest sustainable level of timber volume that can be harvested on the Forest, subject to the MRs of the other resources.

The objective function for this analysis was to maximize volume in the first decade. Comparisons of this benchmark to the other benchmarks show the effect on timber production of meeting other resource and economic objectives.

In addition to those assumptions and constraints listed for all benchmarks, this benchmark will:

- Defer harvest accessibility in areas where existing conditions are inconsistent with prescription standards.
- Vary management intensities according to accessibility for commercial thinning and fertilizer response.

Maximum Recreation

This DEIS benchmark provides for high quality recreation opportunities in both developed and undeveloped settings, and a balance between off-road motorized use and nonmotorized activities consistent with resource protection and land capability. The benchmark emphasizes scenic quality in the viewsheds of State and federal highways, Forest roads, and along all Forest trails.

This benchmark also provides for specialized recreational opportunities in areas of botanic, scenic, geologic, or historic significance as well as some special wildlife habitats. Wilderness opportunities will increase slightly, and the upper McKenzie River would be a Recreation River.

The purpose of this benchmark is to illustrate the Forest's capacity to provide a wide variety of recreation opportunities and determine consequent costs, benefits, and outputs for all resources.

This benchmark estimates the maximum capability of the planning area to provide opportunities for wilderness recreation, nonwilderness dispersed recreation, developed recreation, special feature or habitat related recreation, and wild and scenic river recreation.

Only those assumptions and constraints listed for all benchmarks are pertinent to this benchmark.

ASSUMPTION AND POLICY ANALYSIS

Timber Harvest Policy Analysis

In response to National and Regional direction (1920 8/8/83 and 1920 11/10/83), a series of FORPLAN runs was made to determine the effects of timber harvest policies. The two types of constraints examined were nondeclining yield (NDY), and rotations restricted to 95% CMAI. The effects of these policies were examined independently and in combination. All runs included MRs and were made using a maximum PNV objective function with assigned values.

Runs without NDY as a constraint allowed volumes to vary as much as 25% between successive decades and contained a floor of 86 MMCF (80% of 5 year sell). Runs without CMAI as a constraint could harvest when stands reached the minimum utilization standard of 7 inch d.b.h. Table B-33 shows the results of the sensitivity tests.

Table B-33. Effects of Harvest Scheduling Policy Requirements

Constraints	LTSY (MMCF/Yr)	Change in LTSY (%)	1st Decade PNV (MMCF/Yr)	Change in ASQ (%)	PNV (MM$)	Change in PNV (%)
CMAI + NDY	122.8	--	109.7	--	$4,460	--
W/O CMAI, W/NDY	119.0	- 3.1	113.0	+ 3.0	4,479	+0.43
W/CMAI, W/O NDY	122.4	- 0.3	117.0	+ 6.7	4,568	+ 2.41
W/O CMAI, W/O NDY	122.2	- 0.5	117.5	+ 7.1	4,569	+ 2.44

The effects of constraining rotations to 95% of CMAI are relatively small when compared to those of the nondeclining yield constraint. Changes in present net values generally are related to changes in early decade harvest. The effects of these policies on PNV are summarized as follows:

- Releasing the 95% CMAI constraint results in a 0.43% increase in PNV under a nondeclining yield constraint, and a 0.02% increase without it.
- Releasing the nondeclining yield constraint results in a 2.41% increase in PNV with the 95% CMAI constraint, and 2.0% without it.
- Releasing both constraints simultaneously results in a 2.43% increase in PNV.

The effects of the scheduling policies on the timber resource are summarized as follows:

- Land allocations are not affected by harvest scheduling policies. All acres available for allocation are assigned a timber management prescription regardless of the harvest scheduling requirements used.
- Without the CMAI constraint, first decade harvest increases by 3% with NDY, and by 0.43% without NDY. Conversely, LTSY shows a 3% decrease with NDY, and a 0.16% decrease without NDY.
- Without the NDY constraint, first decade harvest increases by 6.7% with CMAI, and by 4% without CMAI. LTSY shows a slight drop (-0.33%) with CMAI, and a 2.7% increase with CMAI.
- Dropping both CMAI and NDY results in a first decade harvest increase of 7.1%, and a slight decrease of 0.49% for LTSY.

Economic Assumptions

Regional direction for use of price trends requires the use of a 1% increase per year for the first fifty years for the timber value. Other values do not change over time. Regional direction also required sensitivity analysis to examine the effect on the timber volumes scheduled with alternative price trend assumptions of 0% and 3%. The Forest also examined the effects on timber volumes scheduled with a 30% decrease in the base timber value, both with a 0% price trend and a 1% price trend. A final economic analysis tested the effect on timber volumes scheduled with a 20% decrease in timber related costs using a 1% timber price trend. All these analyses were performed with the maximum PNV Benchmark with MRs. Table B-34 contains the results of these analyses. No results differ by more than 0.5% from the result occurring with the assumptions used in the benchmarks and alternatives. Within the range of values and costs tested, the solution from the Forest's FORPLAN model is insensitive to the economic assumptions.

Table B-34. Results of Economic Assumptions Analyses

Economic Assumptions			Effect on Timber Volume (MMCF)		
Percent Base Value	Percent Price Trend	Percent Cost	1st Decade Annual ASQ	15 Decade Volume Total	LTSY
100	1	100%	113.1	17,265	123.1
100	0	100%	113.4	17,301	123.1
100	3	100%	112.5	17,285	122.5
70	0	100%	112.8	17,212	123.4
70	1	100%	112.6	17,223	123.4
100	1	80%	113.4	17,309	122.9

FORMULATION OF ALTERNATIVES

Introduction

Definition

A Forest Plan alternative is a mix of management prescriptions applied in specific amounts and locations of the Forest to achieve desired management goals and objectives. Each alternative within the range of alternatives was developed to meet the following National Forest Management Act (NFMA) (36 CFR 219.12(f)) requirements:

- Be distributed between the maximum and minimum resource potentials of the Forest.
- Be formulated to facilitate analysis of opportunity costs, resource use, and environmental tradeoffs among alternatives.
- Be formulated to facilitate evaluation of present net value (PNV), benefits, and costs of achieving various outputs and nonpriced benefits.
- Address and respond differently to major public issues, management concerns, and resource opportunities.
- Represent the most cost-efficient combination of management prescriptions to meet the objectives of the alternative.
- State the condition and uses that will result from long-term implementation.
- State what goods and services will be produced, including timing and flow of outputs, and the costs and benefits generated.
- State the resource management standards and guidelines.
- State the purposes of the proposed management direction.

The regulations also require that alternative development processes follow the National Environmental Policy Act (NEPA) procedures contained in 40 CFR 1502.14.

Required Alternatives

The following alternatives are required by National or Regional direction:

- No Action: This is the alternative of "No-Action" required by the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14). This alternative would continue the management of the Forest as defined by existing direction in approved management plans; continuation of existing policies, standards, and guidelines; current budgets updated for changing costs over time; and, to the extent possible, production of current levels and mixes of resource outputs consistent with meeting resource management requirements (MRs).

  Alternative A is the No Action Alternative in this FEIS.

- No Change: The "No Change" Alternative was developed in response to decisions made regarding appeal number 1588, brought by the Northwest Forest Resource Council on May 19, 1986. The appeal centered on a decision by Regional Forester James F. Torrence to "require inclusion of management requirements (MRs) in the No Action Alternative for each Forest Plan." The substance of the appeal was that a "true no-action alternative representing current management plans" was not included in Forest Plan EIS's. In response to this, a No Change Alternative has been developed to represent the potential yield of the existing timber management plan, and consequently does not comply with all provisions of the NFMA and regulations promulgated by the Secretary of Agriculture to implement NFMA.

  Alternative NC is the No Change Alternative.

- Emphasis on the current RPA program: This alternative determines how the Current (1980) RPA Program distributed to the Forests through the Regional Guide can best be implemented. Due to public comments, failure to address other key issues, and overall adverse environmental effects, an alternative designed specifically to meet the RPA timber targets is not considered in detail in the FEIS.

  Alternative B-Departure is the RPA program alternative in the DEIS.

- Emphasis on Nonmarket Opportunities: This alternative places emphasis on the production of wildlife, recreation, and other amenity values. Market oriented resources will be managed at economically and environmentally feasible levels consistent with nonmarket opportunities.

  Alternative L is the alternative which emphasizes nonmarket opportunities in this FEIS.

- Emphasis on Market Opportunities: This alternative places emphasis on the production of timber and other market commodities. Management for other resources will be at economically and environmentally feasible levels consistent with the emphasis on market oriented outputs.

  Alternative K is the alternative which emphasizes market opportunities in this FEIS.

- Emphasis on Nondevelopment of Roadless Areas and Intensified Management: This alternative retains all current roadless areas on the Forest in an unroaded condition while managing intensively for commodity production on those areas already roaded.

  The analysis for this alternative was performed, but it was not considered in detail as a final alternative.

Alternative Development and Analysis

The following sections describe how the overall themes and resource issues were developed into a range of alternative land allocations and management direction responsive to NFMA, NEPA, and the public.

Information on the amount, condition, and location of resources has been compiled through inventories of timber conditions, recreation use, wildlife populations, soil and water resources, and roads. These inventories were combined in the Geographical Mapping System (GMS) for use in the development and analysis of alternatives.

Alternative Development

The alternative formulation process began in November 1984 with a review of Forest issues, concerns, opportunities and resource inventories; resource production capabilities identified in the analysis of the management situation; and applicable planning direction. Based on a review of these items resource management options were developed for nine resource areas: Recreation; Fish and Wildlife; Timber; Range; Soil, Water, and Air; Minerals and Energy; Lands; Facilities; and Protection. Each option was comprised of management direction statements for the important factors for that resource. The resource management options were designed to incorporate issues, reflect a particular level of management emphasis, and serve as a potential building block for Forest management alternatives.

The draft resource management options were reviewed by the public during 1985, with disclosure that the resource management options would be used as building blocks for alternatives. The public response was evaluated and some resource options were modified to address the public comments. The resulting options were used as building blocks in the development of preliminary alternatives.

A review of the options for the nine resource areas indicated that achievement of the objectives for some resources primarily depend upon the allocation of land and scheduling of timber harvests (Timber, Recreation, and Fish and Wildlife), while other resources are primarily dependent on program budget and/or administrative action.

Since Timber, Recreation, and Fish and Wildlife each depend on the allocation of land areas, to some degree each is in competition with the other. The options for these resources were, therefore, compared to each other to determine their compatibility. Compatibility was judged by the Interdisciplinary Team (IDT) based on the team's knowledge and experience.

The 6 Recreation options, and 7 Fish and Wildlife options were compared with each other and were compatible through all 42 possible combinations. These 42 options were then compared to the 7 timber management options. Depending on the extent to which Recreation and Fish and Wildlife were emphasized, the timber options were compatible at some levels of production. This comparison resulted in 294 possible combinations but only 106 combinations of these three resources were compatible in an integrated alternative.

Since the range of management options for the resources included output levels close to the minimum and maximum benchmark levels, the preliminary alternatives formulated were by design within the range of benchmark levels, and spread throughout the entire range. Benchmarks are discussed in additional detail in Chapter II, *Development and Use of Benchmarks*.

From these 106 conceivable alternatives, seven preliminary alternatives were identified, based on the following objectives:

- Minimizing the number of alternatives in the array that would still include all of the resource management options,
- Minimizing the duplication of resource options in the array, and
- Maximizing diversity in the mix of resource option combinations.

The resource options for Range, Lands, Minerals and Energy, Facilities, Protection, and Soil, Water, and Air were then compared to the seven preliminary alternatives to determine their compatibility. Most of the options for these six resource areas were found to be compatible with the preliminary alternatives. Options for these resources were then incorporated into each preliminary alternative at a level consistent with the general emphasis of each alternative.

From the combinations of resource option descriptions, seven preliminary alternative descriptions were written and rough estimates of some outputs were made. These alternatives were examined as to how well they resolved major facets of the Forest issues. In doing this the following factors were considered:

- Does the range of alternatives provide an appropriate magnitude of response to the issue?
- What other alternatives should there be?
- Are there inconsistent or incompatible items in the descriptions of the alternatives?

Two alternatives were required by NFMA regulations. These were: No Action, and one demonstrating ability to meet the goals of the Resource Planning Act (RPA), were added to the list for consideration at this time. Two additional variations on preliminary alternatives were developed which allowed for departure from long-term sustained yield as a feature. Due to significant overlap and duplication, three preliminary alternatives were dropped leaving 8 alternatives in the DEIS. In June of 1987 a ninth alternative was included in the array of alternatives in response to decisions made regarding an appeal brought by the Northwest Forest Resources Council. The ninth alternative is referred to as the "No Change" (NC) Alternative and is based on the potential yield of the Forest's 1977 Timber Management Plan.

Many comments, recieved during the review period for the DEIS, expressed the publics reaction to how well the key issues were addressed by the alternatives described above. A large number of the commentors expressed the opinion that not all reasonable and viable means of addressing the issues were considered (or at least considered in sufficient detail) in the DEIS. With the aid of these comments, the Forest IDT and management team revisited the alternative formulation process. The resource options or the management prescriptions and the acre allocations were reviewed and revised. The result of the revisions were 3 additional alternatives in the FEIS that were not considered in the DEIS.

While developing these additional alternatives, the Forest staff and IDT contacted several groups and individuals who had expressed specific concerns that alternatives were not adequately considered in the DEIS. These groups clarified their concerns and helped the IDT develop and analyze alternatives that addressed the concerns. Alternative K and Alternative L were developed in this manner. In addition, planning newsletters were sent to all commentors updating them on the development of Alternatives K, L, and W.

Management Area Development and Management Prescriptions

The identification of land areas which contribute to the goals and objectives of each alternative was an integral part of alternative development. Working from the management options developed earlier, areas of the Forest were identified as particular management areas and assigned a corresponding management strategy.

Management areas are portions of the Forest managed for the same goals and objectives. They are physical units usually delineated on maps, and can be located on the ground. Examples include areas managed to provide specific types of wildlife habitat, particular levels of scenic quality, or intensive timber management. Management strategies (also called management prescriptions) are the direction for activities within management areas, and are detailed in the standards and guidelines that direct on the ground activities, including rates of timber harvest. A total of 38 management areas and strategies were developed for use in the formulation of benchmarks and alternatives. These combinations of resource objectives were available for assignment to specific locations on the Forest as necessary to meet the following criteria:

- Cost efficiency;
- Resource tradeoffs;
- Resource quality and suitability;
- Planning direction;
- Issu resolution.

Cost efficiency, which is a requirement of the NFMA regulations (36 CFR 219.12(f)(8)), is defined as when outputs with assigned dollar values are produced in a way that maximizes net economic value (i.e., benefits minus costs), or are achieved at specified levels in the least costly manner. For the most part analyses on the Forest consistently show this criterion to be met with the highest level of timber production feasible. Therefore, to the extent that timber management was consistent with the other alternative objectives, management strategies were assigned to minimize the impact on the suitable timber land base. Other factors influencing the cost efficiency of an alternative include accessibility, slope, and soil types. These conditions also contributed to management strategy assignment.

In some cases resource tradeoffs were a factor in addition to the economic tradeoffs. Resource quality and suitability were related to the resource tradeoffs considered. For example, attributes such as the size of a roadless area or the opportunity for solitude in a roadless area could influence the assignment of a roadless management area.

Planning direction influenced management area assignment in some cases, particularly in the No Action and No Change Alternatives. Requirements for the No Action and No Change Alternatives mandated use of the land allocations in the current Forest Plan (1977) as a guide for management area assignment. Other direction, such as distribution criteria for spotted owl habitat areas, also influenced management area assignment.

The last criterion, issue resolution, had a direct influence on management area assignment in most alternatives. For example, the roadless area issue varies in intensity according to the particular area under consideration. Similarly, scenic corridors along roads are desired to a greater or lesser degree depending upon the amount and type of use along the road.

Data was then assembled and the management area boundaries used for the alternatives were selected. This process combined analysis and judgment to reflect the optimum assignment of management areas and strategies to meet the goals and objectives of the alternatives developed in the DEIS.

Between the DEIS and the FEIS several of the management areas used to develop the alternatives were also modified. The changes in the management area designations were applied to the alternatives developed since the DEIS (Alternatives K, L, and W) as well as to the alternatives brought forward from the DEIS (Alternatives NC, A, J, and D). In general, these changes did not significantly affect the mangement strategies of the management areas as described in the DEIS nor the outputs or effects associated with them. For more detail on these changes refer to Chapter II, Management Area Prescriptions and Management Areas.

The next major phase of alternative development involved selection of silvicultural prescriptions to meet alternative objectives across the Forest and through time. Silvicultural prescriptions represent the potential sets of timber management activities that can be implemented on timber stands of different conditions, including precommercial thinning, fertilizing, commercial thinning and regeneration harvesting. Silvicultural prescriptions are selected in the FORPLAN model, which seeks to schedule activities in a cost-efficient manner. A total of 4-8 silvicultural prescriptions were available for selection for each management area, depending upon stand condition. The extent to which FORPLAN selects timber harvest prescriptions determines the timber outputs for each alternative.

Iterative Analysis Process

The analysis process began with a series of FORPLAN runs for model calibration. During this period interaction between constraints was analyzed closely with the intent of resloving district concerns and achieving the intended objectives of the constraints. Because of the complexity of combining water quality objectives and dispersion constraints, the Alternative W model was used to calibrate the constraints to match the objectives.

Upon completion of model calibration, the analysis of individual alternatives began. Each alternative analyzed had unique harvest allocations which are discussed later in the section under *Variations from the Standard Model*. To account for those land allocations with reduced harvest rates and to simplify FORPLAN input, a program called VISPLAN was utilized. The VISPLAN program calculates potential timber outputs from areas allocated to reduced harvest prescriptions. Data from VISPLAN was then used to generate yield tables and absolute constraints that accurately model these allocations.

Each model was then solved using an objective function to maximize timber volume for the first decade.

Description of Standard Model Shell

A standard FORPLAN model shell was developed to ease the task of developing the individual models used to analyze alternatives. A description of this basic model is found in Appendix B, The Forest Planning Model. The shell model has a standard set of identifiers, qualifiers, treatment types, activities, outputs, cost data, objective function, and much of the yield data. A standard set of prescriptions also exists for all alternatives except Alternative L which has additional prescriptions of lower harvest. In order to customize the shell model into an alternative model, the analysis areas and constraints unique to the alternative are added to the shell data deck.

Description of Common Constraints

Introduction

Constraints are one tool by which the model can be manipulated in order to provide an accurate mathematical representation of the alternative. Several sets of constraints were applied to the standard

model shell during the analysis of alternatives. These common constraints fall into four catorgories: 1) constraints which assign congressionally and administratively designated areas to specific prescriptions, 2) constraints which ensure that the Management Requirements (MRs) are met in each alternative, 3) timber scheduling constraints, and 4) operational constraints which constrain timber harvest to a realistic solution.

Other constraint sets, such as the visual and recreation constraints, were modeled in the same manner for all alternatives, but the amount and location of the acreages to which they applied varied by alternative. The combination of different acreage allocations and the different constraint levels results in alternative models with different potential outputs, and different optimal objective function values.

Tradeoffs associated with individual constraints is difficult to assess, because any single constraint's effect is highly dependent on its interaction with other constraints in the model. Where tradeoffs associated with constraints are quantified, they are based on benchmark analyses.

Alternative NC (No Change) is an exception since it is based on a significantly different set of assumptions than the other alternatives, and it could not be modeled with the current Forest FORPLAN model. Chapter II, Alternatives Considered, Alternative NC, describes these differences.

Adminstratively and Congressionally Removed Areas

In FORPLAN, all forested lands not classified suitable for timber production were designated to the minimum level prescription in all alternatives so that timber harvest would never be scheduled on them. Most of these lands are areas which have been congressionally or administratively withdrawn from timber production and will be managed as unique management areas. See the FEIS, Appendix D and Chapter IV of the Final Forest Plan for the management direction. The following is a list of these areas and their acreages:

Management Area	Acres
1. Wilderness	380,305
2. Oregon Cascade Recreational Area	6,058
3. HJ Andrews Experimental Forest	15,379
4. Research Natural Areas	
Gold Lake Bog RNA	463
Olallie Rigde RNA	720
Middle Santiam RNA	1,145
Wildcat Mountain RNA	1,000
5. Lamb Butte SIA	390
Soils unsuitable for timber harvest[1]	66,890
Water bodies and areas with less than 10% tree cover[1]	140,502

[1] These land areas are not unique management areas.

Legal and Management Requirement Constraints

Wildlife Constraints

Purpose - The purpose of wildlife constraints is to maintain sustaining habitat for all management indicator species and provide additional protection for special habitats not covered by requirements for management indicator species.

Rationale - These acreage constraints prevent the model from harvesting in wildlife habitat areas vital to maintaining viable populations of targeted species.

Tradeoff - Application of the wildlife constraints maintains habitat quality for management indicator species and additional habitat protection for special habitats and sensitive species not selected as management indicators. When constraints protecting the northern spotted owl were applied, the number of final harvest acres was reduced by approximately 6.2% with associated timber volume of 8.6%. When constraints were applied to protect the habitat of the pileated woodpecker and marten, final harvest acres were reduced by approximately 2.5%, with associated reduced timber volume of 2.7%.

Application - MRs for management indicator species were incorporated in the alternative allocations within the grid mapping system, therefore, no explicit FORPLAN constraints were written.

Riparian Constraints

Alternatives W, D, and L use riparian constraints in addition to these constraints required to meet MRs. Purpose, rationale, and tradeoffs for these constraints are discussed under Alternative Descriptions.

Purpose - The model contains two sets of riparian constraints. Each meet a specific management requirement. The purpose of one set is to reduce timber harvest in riparian areas to meet water temperature standards. The second set removes 21.5% of the riparian areas along Class I, II, and III streams from harvest to provide streambank stability.

Rationale - The riparian constraints limit the acres scheduled for harvest in riparian areas to meet State water quality standards and NFMA.

Tradeoff - Application of the riparian constraints maintains water quality and habitat for fish and aquatic life. When the constraints are applied, the number of final harvest acres are reduced by approximately 3.3%, with associated reduced timber volumes of approximately 3.6% and reduced PNV of approximately 3.1%.

Application - Explicit constraints were written to limit harvest in riparian areas to meet water temperature standards; however, acres removed from harvest for streambank stability was done so through the delineation of analysis areas.

Snag Constraints

Two sets of snag constraints were available to the FORPLAN model. The constraints described below ensure MRs are met regarding snags and down logs and are present in all alternatives. The second constraint set is used in alternatives providing snags and down logs above MRs. This second constraint set is discussed under the Alternative Descriptions where applicable.

Purpose - The purpose of the MR snag constraints is to maintain minimum viable (approximately 20% of biological potential) habitat for primary cavity excavators.

Rationale - These constraints ensure the presence of snags and down logs vital to primary cavity excavators and nesting habitat for other species.

Tradeoff - Application of these constraints maintains quality habitat for primary cavity excavators and other species. When these constraints are applied, the total number of final harvest acres are not necessarily altered; however, timber volume removed from each acre and total PNV are reduced.

Application - These snag requirements were incorporated into the yield tables. Therefore, no explicit constraints were written to meet MRs for snags.

Dispersion Constraints

Purpose - Two sets of dispersion constraints are included in each alternative model formulation. The first constraint set limits final harvest acres to a specified percentage Forest-wide by timber type and size. The second set limits final harvest acres from General Forest to a specified percentage by watershed. The purpose of these constraints is to limit the size of created openings. Dispersion constraints by watershed were combined for the first decade for Alternative W with the hydrologic recovery constraints.

Rationale - The Regional Guide and NFMA place limits on the size of openings that may be created through timber harvest on the National Forests. The dispersion constraints are applied in compliance of these requirements. The Forest-wide constraints approximate an accurate ASQ while dispersion constraints by watershed provide an estimate of spatial limits.

Tradeoff - Application of these constraints reduces model flexibility in selecting prescriptions, resulting in a reduction of the volume of timber produced each decade and a lowered present net value. Application of the dispersion constraints during benchmark analysis resulted in a decrease of 1.5% in timber volumes and a reduced PNV of 5.3%.

On the other hand, application of these constraints ensures that the rate of harvest on a watershed retains forested cutting units between harvest units within each analysis area.

Timber Scheduling Constraints

Long-Term Sustained Yield

Purpose - The long-term sustained yield (LTSY) constraint ensures that the harvest of timber in the last decade is not greater than the long-term timber production capacity of the Forest. Long-term sustained yield capacity is computed using the acreage scheduled to each regeneration prescription applied in the model.

Rationale - To allow conformance with NFMA regulations and ensure the FORPLAN model does not harvest more timber than could be sustained over the long-term.

Tradeoff - The long-term sustained yield constraint limits the flow of harvested timber to a sustainable level. By limiting harvest, economic returns for timber are limited. Additionally, because the removal of timber is controlled, the production of browse and forage in clearcuts is also constrained.

Perpetual Timber Harvest Constraint

Purpose - This constraint ensures that the remaining timber invetory will allow achievement of non-declining harvest levels beyond the modeling horizon. To achieve this condition the constraint requires that the Forest contain as much timber inventory volume at the end of the last period as the Forest would have, on the average, under the management intensities selected in the analysis.

Rationale - To conform with NFMA regulations and to ensure that sufficient timber will remain at the end of the modeling horizon to allow long-term sustained yield.

Tradeoff - By controlling the flow of harvested timber from the Forest, short-term production of timber is reduced.

Harvest Restricted to 95% of Culmination of Mean Annual Increment

Purpose - To ensure production of relatively large sawtimber and to ensure complete site utilization.

Rationale - To prevent the model from harvesting trees smaller than 95% of Culmination of Mean Annual Increment (CMAI). Harvest of smaller trees would mean harvest of trees before the site was completely utilized.

Tradeoff - Removal of this constraint would allow the model greater flexibility in selecting prescriptions which could result in greater harvested volumes and returns and in greater present net values.

Nondeclining Yield

Purpose - The nondeclining yield constraint is applied in nondeparture runs of the model to ensure that the harvest of timber in a decade is greater than or equal to the harvest of timber in the previous period.

Rationale - Application of the nondeclining yield constraint in the model prevents timber volumes from ever declining and allows conformance with NFMA regulation requirements.

Tradeoff - Application of the nondeclining yield constraint provides for a steady or increasing flow of harvested timber from the Forest. Community economic and social stability is due to the controlled flow of timber. The nondeclining yield constraint limits the model to a lower present net value and a reduced flow of timber in early decades.

Operational Constraints

First Period Thinning Constraint

Purpose - To constrain FORPLAN from thinning 13,500 acres recently thinned on the Forest.

Rationale - To allow the FORPLAN model to thin only those acres available for thinning in the first period.

Tradeoff - Application of the thinning constraint provides a more accurate solution of the amount of acres available for thinning in the first decade. Since these acres have already been thinned there is no real loss in timber volume.

Visual and Recreation Constraints

The visual and recreation constraints are applied at different levels and to different land areas, depending on the alternative. The form and purpose of the constraints remain the same in all runs which is why the general form of the constraints is discussed here. The individual constraint levels are discussed in the description of each alternative.

Visual and Recreation Constraints

Purpose - Timber harvesting is allowed on lands where the visual and recreation constraints are applied. These lands are in sensitive scenic areas or are used for recreation purposes. The visual and recreation constraints limit the acres of final timber harvest per period at or below a level consistent with visual or recreational use.

Rationale - These constraints ensure that the harvest rate applied to these areas is consistent with the needs for scenic and recreational experiences.

Tradeoff - Application of these constraints maintains areas of enhanced scenic and recreational quality. The constraints, however, reduce the number of final harvest acres, thereby reducing timber harvests and present net value.

DEVELOPMENT AND ANALYSIS OF ALTERNATIVES

Alternative NC (No Change)

Purpose of the Alternative

The "No Change" Alternative was developed in response to decisions made regarding Appeal Number 1588, brought by the Northwest Forest Resource Council on May 19, 1986. The appeal centered on a decision by Regional Forester James F. Torrence to "require inclusion of minimum management requirements (MMRs) in the No Action Alternative for each Forest Plan." The substance of the appeal was that a "true no-action alternative representing current management plans" was not included in Forest Plan EIS's. In response to this, a No Change Alternative has been developed to represent the existing timber management plan, and consequently does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture to implement NFMA.

Current management plans represented by the No Change Alternative fail to comply with the following NFMA regulations in whole or in part:

- 36 CFR 219.14 - Timber resource land suitability: requires identification of lands not suited for timber production based on risk of irreversible resource damage, lack of assurance of reforestation within five years, or withdrawl by Act of Congress, Secretary of Agriculture, or Chief of Forest Service.

- 36 CFR 219.16 - Requires that all alternatives identify decadal timber harvest levels and long-term sustained yield levels, consistent with the requirements of the RPA program and Regional guide. Also specifies conditions under which departure from nondeclining yield will be considered.

- 36 CFR 219.18 - Requires that Wilderness management direction be provided, including actions needed to limit or distribute visitor use,and measures desirable to protect the Wilderness or adjacent areas from wildfire, insects or disease.

- 36 CFR 219.19 - Provides for viable populations of vertebrate wildlife species, the selection and monitoring of management indicator species, cooperation with wildlife management agencies, and protection of habitat critical to threatened or endangered species.

- 36 CFR 219.23 - Requires full consideration of water and soil resources including estimates of current water uses, instream flow requirements, protection of water quality, watershed condition, and protection of wetland and floodplain values.

- 36 CFR 219.27 - Identifies specific management requirements to be used in the development, analysis, approval, implementation, monitoring and evaluation of forest plans for activities including: silvicultural practices, resource protection, vegetative manipulation, protection of riparian areas, protection of soil and water, and maintenance of diversity.

The timber management plan upon which the No Change Alternative is based was developed in 1977. The plan was not an integrated resource plan, and consequently did not address all resource uses and outputs. The original plan was based on yield tables and resource relationships which do not reflect the latest scientific techniques and information and do not reflect the standards in the NFMA regulations. The timber management plan has been amended following Congressional designations (new Wilderness and Wilderness additions), but there has not been reconcilitation of the timber management plan with unit plan direction and requirements of NFMA.

The No Change Alternative could not be implemented or used in future management of the Forest under the Forest Plan without Congressional and/or Secretary of Agriculture action to change the law or regulations.

The No Change Alternative represents continued implementation of the Forest's existing land management and timber management plan. This alternative would: maintain timber outputs equivalent to the potential yield of the 1977 Timber Management Plan and to the extent possible produce current levels and mixes of other resource outputs; and continue policies, standards and guidelines of existing plans. This alternative does not incorporate Management Requirements called for by NFMA.

A detailed description of the Alternative NC goals and objectives are found in Chapter II, Alternative Goals and Management Objectives, of the FEIS document. Several of the major goals and objectives for Alternative NC are summarized below:

- Maintain acres of old-growth in areas administratively and legislatively removed from development and lands unsuited for timber production.

- Emphasize a high to moderate level of scenic quality within the foreground zones of all State and federal highways. The overall scenic quality of the Forest viewshed corridors, however, have a low to moderate emphasis.

- Approximately 88% of the suitable timber will be managed on rotations less than 100 years and the remaining 12% of the acres on rotation ages 100 to 200 years.

- Maintain significant portions of eight inventoried roadless areas and lesser amounts of other inventoried roadless areas in an undeveloped condition.

- Riparain ares would be managed at minimum levels for water quality protection.

Benchmark comparisons, model formulation, and constraint evaluation

The No Change Alternative is based on a significantly different set of assumptions than were the other alternatives and benchmarks and could not be modeled within the current Forest FORPLAN model formulation. The differences are discuss in Chapter II, Alternative Goals and Management Objectives, FEIS. The remaining alternatives in this section are tied to the FORPLAN model formulation, and therefore, comparisons could not be developed for the No Change Alternative.

Alternative K

Purpose of the Alternative

The purpose of Alternative K is to maintain a timber supply level equal to the historical level. The alternative meets all MRs but has a low emphasis on nonmarket values and a high emphasis on commodity production and developed recreation.

This alternative was formulated with input from the Willamette Forestry Council (WFC) and is designed to maintain high levels of timber harvest by making most of the Forest's tentatively suited land available for timber production.

A detailed description of the Alternative K goals and objectives is found in Chapter II, Alternative Goals and Management Objectives of the FEIS document. Several of the major goals and objectives for Alternative K are summarized below:

- Maintain and enhance privately and publicly managed recreation sites to meet increased demand for developed site use.
- Maintain significant portions of 2 inventoried roadless areas in an undeveloped condition.
- Emphasize a moderate to high level of scenic quality within foreground zones along all State and federal highways. The overall scenic quality of Forest viewshed corridors, however, have a low to moderate emphasis.

Alternative Criteria and Assumptions

The following assumptions were made during the formulation of the Alternative K model.

- Timber harvest is scheduled only on lands classified as suitable for timber harvest.
- Timber harvest cannot exceed the long-term sustained yield capacity in any decade.
- Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long-term sustained yield capacity.
- Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).
- Regeneration harvests cannot be scheduled until stands have reached 95% of CMAI.

- Objective function used is to maximize timber volume for the first decade.

Relationships to Issues and Benchmarks

Alternative K maintains significant portions of 2 inventoried roadless areas in an undeveloped condition. In comparison, the maximum recreation benchmark maintains all 100% of the inventoried roadless acres as roadless, while the maximum present net value and maximum timber benchmark maintains no roadless areas.

The first-period timber harvest under the maximum timber benchmark is 118.1 MMCF. Alternative K schedules a 113.9 MMCF first-period harvest.

Alternative K addresses the wildlife and fish habitat issue by providing the required management for spotted owl, marten and pileated woodpecker. Fish habitat is also maintained at required management levels. These habitat levels are identical to the levels in the maximum PNV benchmark run. Effective habitat for deer and elk would be provided by designating High, Moderate, and Low Emphasis Areas. Winter range would be 11% high emphasis, 34% moderate emphasis, and 55% low emphasis. No benchmarks maintain effective habitat for deer and elk with a High, Moderate, and Low Emphasis Areas. Alternative D designates 66% high emphasis, 21% moderate emphasis, and 14% low emphasis.

Dispersed recreation is addressed in Alternative K by providing 48,300 acres for semiprimitive motorized recreation and 14,400 acres for semiprimitive non-motorized recreation. In comparison, the maximum PNV benchmark allocates no acreage to either of these categories, and the maximum recreation benchmark allocates 48,504 acres to semiprimitive motorized recreation and 229,511 acres to semiprimitive nonmotorized recreation.

The scenic quality issue is addressed in Alternative K by allocating 123,600 acres to the modification standard, 147,500 acres to partial retention, and 72,000 acres to retention. This is in contrast to the maximum PNV and maximum timber benchmark run which does not allocate any Forest acres to visual management. The recreation benchmark allocates 565,000 acres to the modification standard, 4,000 acres to partial retention, and 402,000 acres to retention.

Variations from the Standard Model

In order to ensure that the Alternative K FORPLAN model accurately reflected the alternative's intent allocations of land shown in Table B-35 were used as constraints in the model and to delineate analysis areas. The management areas listed in the first part of Table B-35 are not directly entered into the FORPLAN model as a management emphasis. Instead the management areas are broken down in terms of their allowed harvest rate and these harvest rates become the management emphasis.

Table B-35. Alternative K Major Land Allocations

Management Area	Possible Harvest Rates	Acres
Timber	12+%	825,899
Visual	5,6,8,9,A,B	196,044
Recreation	No harvest, 7%	78,324
Wilderness	No harvest	380,805
Wildlife	No harvest	120,345
Riparian	5%, 7%	50,637
Other	No harvest	23,356
Management Emphasis	**Level 7 FORPLAN Identifier**	**Acres**
5% harvest rate	55	73,247
7% harvest rate	77	76,681
10% harvest rate	10	32,614
12% harvest rate	12	79,774
Timber (12+%)	TI	702,525
No Harvest	No harvest	710,566

Common Constraints

Complete descriptions of the common constraint sets applied in the Alternative K model are found in Appendix B, Description of Common Constraints. The standard sets of wildlife, snags, riparian, and harvest dispersion constraints were applied in the Alternative K model. Visual and recreation constraints were applied in the Alternative K model. These constraints limit harvest on acres with visual and recreation emphasis to rates of either 5%, 7%, 10%, or 12%. A long-term sustained yield capacity was computed internally by the FORPLAN model during the alternative analysis. This long-term sustained yield constraint, the nondeclining yeld constraint, and the perpetual timber harvest constraints were applied in the model. The Alternative K model limits the harvest of timber to within 95% of CMAI of the harvested stand by restricting the earliest age for final harvest entry. The common first-period thinning constraint was also applied in this model.

Unique Constraints

No unique constraints were applied in development of Alternative K.

Alternative A (No Action)

Purpose of the Alternative

Alternative A portrays continued management of the Forest under current direction. This alternative has been designated the "No Action" alternative. The alternative provides no change from the current management of the Forest with the exception of modifying management direction to meet MRs as required under NFMA. Management of the Forest is currently guided by the existing Forest Plan completed in 1977. This alternative uses the land allocations from the 1977 plan as a base, with the addition of MRs for wildlife and riparian areas, and updates on inventories.

This alternative features a blend of resource uses which address to varying degrees the major issues on the Forest. This alternative, emphasizes a high level of timber production wherever compatible with other resource objectives and places low emphasis on roadless recreation and other non- commodity forest uses. Other programs, organization support, and service to the public is at current levels.

A detailed description of the Alternative A goals and objectives is found in the FEIS, Chapter II, *Alternative Goals and Management Objectives*. Several of the major goals and objectives for Alternative A include:

- Maintain significant portions of eight inventoried roadless areas and lesser amounts of other inventoried roadless areas in an undeveloped condition.
- Maintain acres of old growth in areas administratively and legislatively removed from development, lands unsuited for timber production, and areas set aside for riparian and wildlife.
- Emphasize a moderate level of scenic quality within foreground zones of all State and federal highways. The overall scenic quality of Forest viewshed corridors has a low to moderate emphasis.
- Provide full yield from approximately 85% of the suitable timber base at management intensities that are appropriate for the site quality and accessibility and are the most economically efficient. Reduced yields on the remaining 15% of the forest are required to meet quality standards for water, scenery, and dispersed recreation.
- Provide suitable habitat to meet MRs for the northern spotted owl, pileated woodpecker, and marten.

Alternative Criteria and Assumptions

The following assumptions were made during the formulation of the Alternative A model.

- Timber harvesting is scheduled only on lands classified as suitable for timber harvest.
- Timber harvests cannot exceed the long-term sustained yield capacity in any decade.
- Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvests at the long run sustained yield capacity.
- Timber harvests cannot decrease in any decade as compared to the immediately preceding decade (NDY).
- Regeneration harvests cannot be scheduled until stands have reached 95% CMAI.
- Objective function used is to maximize timber volume for the first decade.

Relationships to Issues and Benchmarks

Alternative A maintains significant portions of eight inventoried roadless and lesser amounts of other inventoried roadless areas in an undeveloped condition. The majority of the Mt. Hagan roadless area is available for multiple-use management including a Research Natural Area and timber harvest. In contrast, the maximum recreation benchmark maintains 100% of the inventoried roadless areas in a roadless condition. The maximum present net value and maximum timber benchmark maintains no roadless areas.

Alternative A addresses the timber supply issue by scheduling 107.2 MMCF of timber for harvest in the first period. This level compares to the maximum timber benchmark which schedules 118.1 MMCF in first-period timber harvest, and the minimum management benchmark which harvests no timber in any decade. In relationship to the old-growth issue, Alternative A retains 528,400 acres of old-growth/large sawtimber at the end of the first period, and 337,000 acres at the end of the fifth. The maximum timber benchmark retains 525,400 acres of old-growth/large sawtimber after the first period, and 306,300 acres after the fifth period. The minimum management benchmark retains at least 870,000 acres of old growth in all periods.

Alternative A addresses the wildlife and fish habitat issue by providing the required managementt level of habitat for marten and pileated woodpecker. This same level of habitat is allocated in the maximum PNV benchmark run. Effective habitat for deer and elk would be provided by designating High, Moderate, and Low Emphasis Areas. Winter range would be 18% high emphasis, 35% moderate emphasis, and 47$ low emphasis. No benchmarks maintain effective habitat with Emphasis Areas. Alternative D allocates 66% to high emphasis, 21% to moderate emphasis, and 14% low emphasis.

Alternative A provides for dispersed recreation by allocating 23,400 acres to semiprimitive motorized recreation and 72,200 acres to semiprimitive nonmotorized recreation. The maximum recreation benchmark allocates 48,504 acres to semiprimitive motorized recreation, and 229,511 acres to semiprimitive nonmotorized recreation. In contrast to these levels, the maximum PNV benchmark run does not allocate any acreage to either of these categories.

The scenic quality issue is addressed in Alternative A by allocation of 4,500 acres of visual corridors on the Forest to modification, 150,100 acres to partial retention, and 77,900 acres to retention. These levels are in contrast to the maximum present net value benchmark which does not allocate any Forest acres to visual management and the recreation benchmark which allocates 565,000 acres to modification standards, 4,000 acres to partial retention, and 402,000 acres to retention standards.

Variations from the Standard Model

In order to ensure that the Alternative A FORPLAN model accurately reflected the current plan (with the addition of MRs), allocations of land (shown in Table B-36) were used to derive constraints in the model and to delineate analysis areas. The management areas listed in the first part of Table B-36 are not directly entered into the FORPLAN model as a management emphasis. Instead the management areas are broken down in terms of their allowed harvest rate and these rates become the management emphasis.

Table B-36. Alternative A (No Action) Major Land Allocations

Management Area	Possible Harvest Rates	Acres
Timber	12+%	880,225
Visual	5%, 7%, 10%	118,723
Recreation	No harvest, 5%, 7%, 10%	113,966
Wilderness	No harvest	380,805
Wildlife	No harvest	109,551
Riparian	5%, 7%, 10%,	47,993
Other	No harvest	24,167
Management Emphasis	**Level 7 FORPLAN Identifier**	**Acres**
5% harvest rate	55	66,208
7% harvest rate	77	76,852
10% harvest rate	10	11,134
Timber (12+%)	TI	749,195
No Harvest	00	772,041

Common Constraints

Complete descriptions of the common constraint sets applied in the Alternative A model are found in Appendix B, Description of Common Constraints. The standard sets of wildlife, snags, riparian, and harvest dispersion constraints were applied in the Alternative A model. Visual and recreation constraints were also present in the Alternative A model. These constraints limit harvest on areas with visual and recreation emphasis to rates of either 5%, 7%, and 10%. A long-term sustained yield capacity was computed internally by the FORPLAN model during the alternative analysis. The long-term sustained yield constraint, nondeclining yield constraints and a perpetual timber harvest constraint were also applied in the model. The Alternative A model limits the harvest of timber to within 95% of CMAI of the harvested stand by restricting the earliest age for final harvest entry. The common first-period thinning constraint was also applied in this model.

Unique Snag Constraints

In addition to MRs (see Description of Common Constraints), snags were left equivalent to 40% of the biological potential of each watersehed.

Purpose - To achieve a level of habitat quality for primary cavity execavators (PCE) equivalent to 40% of the biological potential of each subbasin.

Rationale - Addition of these constraints allows habitat quality consistent with Alternative A goals and objectives and accurate estimation of the effect on timber harvest volume.

Tradeoffs - This constraint does not reduce the final harvest acres but reduces the volume of timber removed from final harvest acres.

Alternative J

Purpose of the Alternative

Alternative J represents a moderate emphasis on nonmarket resources and a moderate emphasis on commodity production. The focus of Alternative J is to balance the timber, roadless area, old-growth, fish and wildlife, and scenery issues in a way that provides some degree of resolution for each.

A detailed description of the Alternative J goals and objectives is found in Chapter II, Alternative Goals and Management Objectives, FEIS. Several of the major goals and objectives for Alternative J are summarized below:

- Continue Wilderness management at current levels while expanding existing capacity of publicly managed sites.
- Maintain significant portions of 13 inventoried roadless areas and lesser amounts of other inventoried roadless areas in an undeveloped condition.
- Ensure no landscape alterations are evident in foreground areas of all State and Federal highways, major forest roads, and selected trails.
- Maintain old-growth acres administratively and legislatively removed from development, land unsuited for timber production, and areas set aside for riparian and wildlife MRs for at least fifty years.
- Provide full timber yields on 720,000 acres of the suitable forest land and reduced levels of timber production on 133,000 acres.

Alternative Criteria and Assumptions

The following assumptions were made during the formulation of the Alternative J model:

- Timber harvest is scheduled only on lands classified as suitable for timber harvest.
- Timber harvest cannot exceed the long-term sustained yield capacity in any decade.
- Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long-term sustained yield capacity.
- Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).
- Regeneration harvests cannot be scheduled until stands have reached 95% of CMAI.
- Objective function used is to maximize timber volume for the first decade.

Relationships to Issues and Benchmarks

Alternative J maintains 341,400 acres, or 57%, of the inventoried unroaded acres in an unroaded condition. By comparison, the maximum present net value benchmark run reserves no roadless areas,

and the maximum recreation benchmark retains 100% of the inventoried roadless areas in roadless condition. Under the maximum recreation benchmark, 210,000 acres of roadless area are retained.

Alternative J addresses the timber supply issue by harvesting 92.3 million cubic feet (MMCF) of timber in both the first and fifth periods. This is in contrast to the maximum timber benchmark which harvests 118.1 MMCF in both the first and fifth periods. Alternative J addresses the old-growth issue by retaining 534,900 acres of old-growth after the first period, and 341,100 acres after the fifth period. The maximum timber benchmark retains 525,450 acres of old-growth after one period and 306,290 acres after five periods.

The wildlife habitat issue is addressed by providing the required management level of habitat for marten and pileated woodpecker. These are the same levels that are applied in the maximum present net value benchmark. Alternative J provides for 59 spotted owl management areas excluding Wilderness. Alternative L, which provides the most habitat for interior wildlife species of any alternative or benchmark, maintains 59 SOHAs and habitat capability for 219 pairs Forest-wide, and management requirement levels of habitat for marten and pileated woodpecker. Effective habitat for deer and elk would be provided by designating High, Moderate, and Low Emphasis Areas. Winter range would be 35% high emphasis, 26% moderate emphasis, and 39% low emphasis. No benchmards maintain effective habitat through the use of Ephasis Areas. Alternative D allocates 66% to high emphasis, 21% to moderate emphasis, and 14% to low emphasis.

Dispersed recreation is provided for in Alternative J by allocating 31,300 acres to motorized semiprimitive recreation use and 89,500 acres to nonmotorized semiprimitive recreation use. These levels are in contrast to the maximum recreation benchmark which allocates 48,504 acres to semiprimitive motorized recreation and 229,511 acres to semiprimitive nonmotorized recreation or in comparison to the maximum present net value benchmark which does not allocate any acreage to either of these categories.

The scenic quality issue is addressed in Alternative J by allocating 206,200 acres to modification visual standards, 177,700 acres of visual corridors to partial retention standards, and 90,500 acres to retention standards. These levels are in contrast to the maximum present net value benchmark which does not allocate any Forest acres to visual management and the recreation benchmark which allocates 565,000 acres to modification standards, 4,000 acres to partial retention, and 402,000 acres to retention standards.

Variations from the Standard Model

In order to ensure that the Alternative J FORPLAN model accurately reflected the alternative's intent, allocations of land (shown in Table B-37) were used as constraints in the model and used to delineate analysis areas. The management areas listed in the first part of Table B-37 are not directly entered into the FORPLAN model as a management emphasis. Instead, the management areas are broken down in terms of their allowed harvest rate and these harvest rates become the management emphasis.

Table B-37. Alternative J Major Land Allocations

Management Area	Possible Harvest Rates	Acres
Timber	12+%	611,247
Visual	5%, 7%, 10%, 12%	343,327
Recreation	No harvest, 5%, 7%, 10%	156,244
Wilderness	No harvest	380,805
Wildlife	No harvest	111,812
Riparian	5%, 7%, 10%	45,389
Other	No harvest	26,577
Management Emphasis	**Level 7 FORPLAN Identifier**	**Acres**
5% harvest rate	55	68,085
7% harvest rate	77	78,388
10% harvest rate	10	42,681
12% harvest rate	12	174,778
TI (12+%)	TI	518,554
No Harvest	00	792,921

Common Constraints

Complete descriptions of the common constraints sets applied in Alternative J model are found in this section under, Description of Common Constraints. The standard sets of wildlife, snags, riparian, and harvest dispersion constraints were applied in the Alternative J model. Visual and recreation constraints were also present in the Alternative J model. These constraints limit harvest on the different areas with visual and recreation management emphasis to rates of either 5%, 7%, 10%, or 12%, consistent with the alternative objectives. The standard first-period thinning acreage constraint was also applied in the model. The Alternative J model limited the harvest of timber to within 95% of CMAI by restricting the earliest age for harvest. A long-term sustained yield constraint which uses an internally computed sustained yield was used along with nondeclining yield constraints to regulate harvesting in the model.

Unique Constraints Snag constraints

In addition to MRs (see previous subsection, Description of Common Constraints), snags were left equivalent to 40% of the biological potential of the site.

Purpose - To achieve a level of habitat quality for PCE equivalent to 40% of the habitat potential of the site.

Rationale - Addition of these constraints ensure the FORPLAN model meets the alternative objectives of snag levels and allows the impact on timber harvest to be evaluated.

Tradeoff - These constraints do not reduce the final harvest acres but reduce the volume of timber removed from final harvest acres.

Unique Big-game constraints

Purpose - These constraints assure Alternative J, being the DEIS Preferred Alternative, meets the MRs set forth in the DEIS.

Rationale - To meet Alternative J goals and objectives for assuring habitat effectiveness for deer and elk.

Tradeoff - These constraints were incorporated into the analysis areas directly removing acres from the timber base and reducing the model's ability to assign final harvest acres.

Alternative W

Purpose of the Alternative

The focus of Alternative W is to provide a healthy, diverse, and productive ecosystem that will ensure the capability of the Forest to produce a continuous flow of a variety of goods and services to the public over the long term.

Alternative W provides direction for continued dependable supply of timber to the market while providing for a wide range of non-commodity uses of the Forest.

A detailed description of the goals and objectives for Alternative W is listed in Chapter II, Alternative Goals and Objectives, FEIS. Several of the major goals and objectives for Alternative W are summarized below:

- Maintain all existing recreation sites under the current mix of public and private management and expand the existing capacity of publicly managed sites. Maintain significant portions of the Forest's semiprimitive dispersed recreation opportunities in an undeveloped condition.
- Maintain significant portions of 13 inventoried roadless areas and lesser amounts of other roadless areas in an undeveloped condition.
- Ensure no landscape alterations are evident in foreground areas of all State and federal highways, major forest roads, and selected trails. Emphasize moderate level of scenic quality within major viewshed corridors.
- Provide for full timber yields on 689,000 acres of the suitable land base and reduced levels of timber production on 85,000 acres. (total 774,608)
- Provide suitable habitat to meet MRs for the northern spotted owl, pileated woodpecker, and marten.
- Maintain or improve water quality to levels which meet or exceed the needs of the beneficial uses of the water.

Alternative Criteria and Assumptions

The following assumptions were made during the formulation of the Alternative W model:

- Timber harvest is scheduled only on lands classified as suitable for timber harvest.
- Timber harvest cannot exceed the long-term sustained yield capacity in any decade.

- Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long-term sustained yield capacity.
- Timber harvest cannot decrease in any decade when compared to the immediately preceding decade (NDY).
- Regeneration harvests cannot be scheduled until stands have reached 95% of CMAI.
- Objective function used is to maximize timber volume for the first decade of the modeling horizon.

Relationships to Issues and Benchmarks

In relation to the roadless lands issue, Alternative W maintains 53% of the inventoried roadless acres in an unroaded condition. In contrast, the maximum recreation benchmark maintains 100% of the inventoried roadless acres as roadless, while the maximum present net value and maximum timber benchmarks maintain no roadless areas.

Alternative W addresses the timber supply issue by harvesting 84.8 million cubic feet (MMCF) of timber in both the first and fifth periods. This is in constrast to the maximum timber benchmark which harvest 118.1 MMCF in both the first and fifth periods. Alternative W address the old-growth issue by retaining 533,000 acres of old-growth after the first period, and 365,200 acres after the fifth period. The maximum timber benchmark retains 525,450 acres of old growth after one period and 306,290 acres after five periods.

The wildlife habitat issue is addressed by providing the required management level of habitat for marten and pileated woodpecker. These are the same levels that are applied in the maximum present net value benchmark. Alternative W provides for 94 spotted owl management areas including Wilderness. Alternative L which provides the most habitat for interior wildlife species of any alterantive or benchmark maintains a total of 219 spotted owl management areas and required management levels of habitat for marten and pileated woodpecker. Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphasis Areas. With Alternative W winter range would be 31% high emphasis, 46% moderate emphasis, and 23% low emphasis. No benchmarks use maintain effective habitat through the use of Emphasis Areas. Alternative D allocates 66% to high emphasis, 21% low emphasis, and 14% low emphasis.

Dispersed recreation is provided in Alternative W by allocating 36,048 acres of forest to motorized semiprimitive recreation use, and 85,768 acres to nonotorized semiprimitive recreation use. These levels are in constrast to the maximum recreation benchmark which allocates 48,504 acres of the Forest to nonmotorized recreation. In comparison to these levels, the maximum present net value benchmark does not allocate any acreage to either of these categories.

The scenic quality issue is addressed in Alternative W by allocating 143,000 acres of visual corridors to modification visual standard, 171,700 acres of visual corridors to partial retention, and 118,800 acres to retention status. These levels are in contrast to the maximum present net value benchmark which does not allocate any Forest acres to visual management and the recreation benchmark which allocates 565,000 acres to modification standards, 4,000 acres to partial retention, and 402,000 acres to retention standards.

Variations from the Standard Model

To ensure that the Alternative W FORPLAN model accurately reflected the alternative's intent, allocations of land shown in Table B-38 were used to derive constraints in the model and delineate analysis areas. The management areas listed in the first part of Table B-38 are not directly entered into the FORPLAN model as a management emphasis. Instead the management areas are broken down in terms of their allowed harvest rate and these harvest rates become the management emphasis.

Table B-38. Alternative W Major Land Allocations

Management Area	Possible Harvest Rates	Acres
Timber	12+%	646,981
Visual	5%, 7%, 10%, 12%	277,439
Recreation	No harvest, 5%, 7%, 10%	166,673
Wilderness	No harvest	380,805
Wildlife	No harvest	125,953
Riparian	No harvest	50,522
Other	No harvest	27,004
Management Emphasis	**Level 7 FORPLAN Identifier**	**Acres**
5% harvest rate	55	44,298
7% harvest rate	77	44,814
10% harvest rate	10	62,638
12% harvest rate	12	114,184
Timber (12+%)	TI	542,817
No Harvest	00	866,655

Common Constraints

Complete descriptions of the common constraint sets applied in the Alternative W model are found in Appendix B, Description of Common Constraints. The standard sets of wildlife, snags, riparian, and harvest dispersion constraints were applied in the Alternative W model. Visual and recreation constraints were also present in the Alernative W model. These constraints limit harvest on areas with visual and recreation emphasis to rates of either 5%, 7%, 10%, or 12%. The Alternative W model limited the harvest of timber to within 95% of the CMAI by restricting the earliest age for harvest. Long-term sustained yield capacity was computed internally by the FORPLAN model during the alternative analysis. The nondeclining yield constraint, perpetual timber harvest constraint, and the first-period thinning constraints were also applied in this model.

Unique Constraints

Unique Aggregated Recovery Percentage Constraint

Peak flows resulting from rain-on-snow events may be significantly increased through creation of openings during timber harvest, adversely affecting the condition of a watershed. To quantitatively evaluate the condition of a watershed a measure termed Aggregate Recovery Percentage (ARP) has been developed. For a detailed discussion on ARP refer to this Appendix, The Forest Planning Model,

Yield Coefficients. ARP has been used in the Alternative W model as a method of constraining the model to maintain or improve water quality.

Purpose - The purpose of these constraints is to protect streambank and stream channel stability as a method of maintaining or improving water quality.

Rationale - These constraints are a method to meet Alternative W goals and objectives for maintaining or improving water quality.

Tradeoff - These constraints were applied for decades 2 through 15, therefore, first-period timber harvest was not affected. These constraints however, limited the prescriptions chosen by the model lowering final harvest acres and timber volume for future decades.

Unique First-period Riparian Constraints

Purpose - The purpose of these constraints is to protect streambank and stream channel stability while incorporating the use of harvest dispersion.

Rationale - Prevented opportunities for FORPLAN to violate modeling assumptions on the subdrainage level that existed when ARP and harvest dispersion were not considered together.

Tradeoff - These absolute constraints were applied for the first-period only, directly reducing the final harvest acres and volume removed in the first decade.

Riparian and Wildlife Constraints

Purpose - The purpose of these constraints was to increase
effectiveness on winter range for deer and elk, and to limit harvest on unstable landtypes adjacent to Class IV streams.

Rationale - To reduce the risk of winter mortality by preventing the model from harvesting optimal cover on winter range for deer and elk and to minimize the risk of debris torrents by retaining trees needed for the stability of potentially unstable landtypes.

Tradeoff - These absolute constraints were applied during the first-period, directly reducing the final harvest acres and total volume removed.

Unique Class I, II, III Riparian Constraints

Purpose - The purpose of these constraints was to prohibit timber harvest around Class I, Class II, and Class III streams and lakes.

Rationale - By prohibiting the harvest of timber in these areas, water quality and fish habitat quality are maintained or improved, meeting the alternative goals and objectives.

Tradeoff - A majority of these acres were removed from the timber base (with the exception of those acres already removed for MRs) directly reducing the final harvest acres and volume harvest.

Application - These constraints were represented in the model by shifting all acres normally allocated to riparian harvest prescriptions to analysis areas prohibiting timber harvest.

Alternative D

Purpose of the Alternative

Alternative D combines a high emphasis on nonmarket resources with the need for commodity production. Alternative D was brought forward from the DEIS to provide a continous range of responses to significant public issues.

A detailed description of the Alternative D goals and objectives are found in Chapter II, Alternative Goals and Management Objectives of the FEIS document. Several of the major goals and objectives for Alternative D are summarized below:

- Maintain a high level of scenic quality throughout the Forest.
- Exceed MRs for fish and wildlife habitat. Provide suitable habitat for 137 pairs of spotted owls.
- Provide for timber production with full yields on 639,000 acres of the total suitable acres. Providing for a reduced level of timber production on the remaining 80,000 acres of the Forest in order to meet quality standards for water, scenery, and dispersed recreation.
- Maintain significant portions of most inventoried roadless areas, and lesser amounts of other inventoried roadless areas in an undeveloped condition. Expanding the number of Research Natural Areas by adding four new areas for a total of eight.

Alternative Criteria and Assumptions

The following assumptions were made during the formulation of the Alternative D model:

- Timber harvest is scheduled only on lands classified as suitable for timber harvest.
- Timber harvest cannot exceed the long-term sustained yield capacity in any decade.
- Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long-term sustained yield capacity.
- Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).
- Regeneration harvests cannot be scheduled until stands have reached 95% CMAI.
- Objective function used is to maximize timber volume for the first period of the model horizon.

Relationships to Issues and Benchmarks

Alternative D addresses the roadless lands planning issue by maintaining 80% of all inventoried roadless areas in an unroaded condition. This is in contrast to the maximum recreation benchmark which maintains 100% of the inventoried roadless areas as roadless and in contrast to the maximum present net value and maximum timber benchmarks which allocate no land to roadless areas.

In relation to the timber supply issue, Alternative D harvests 83.6 million cubic feet (MMCF) of timber in the first period. This is in contrast to the maximum timber benchmark which harvests 118.1 MMCF in the first period and the minimum management benchmark which harvests no timber in any period.

The wildlife habitat issue is addressed in Alternative D by exceeding MRs for marten and pileated woodpecker habitat and providing 26 bald eagle sites. Out of a total inventory of 219 spotted owl pairs, 137 are maintained in Alternative D. Effective habitat for deer and elk would be provided by designating High, Moderate, or Low Emphasis Areas. With Alternative D winter range would be 66% high emphasis, 21% moderate emphasis, and 14% low emphasis. No benchmarks maintaint effective habitat through the use of Emphasis Areas.

Dispersed recreation opportunities are provided in Alternative D by allocating 38,245 acres of land to semiprimitive motorized recreation and 176,484 acres to semiprimitive nonmotorized recreation. These levels compare to the maximum recreation benchmark which allocates 48,504 acres to semiprimitive motorized recreation and 229,511 acres of Forest to nonmotorized recreation. In contrast to these levels, the maximum PNV benchmark does not allocate any acreage to either of these categories.

The scenic quality issue is addressed by allocating 108,400 acres of visual corridors managed to modification standards, 245,700 acres to partial retention, and 142,100 acres to retention. These levels are in contrast to the maximum present net value benchmark which does not allocate any Forest acres to visual management and the recreation benchmark which allocates 565,000 acres to modification standards, 4,000 acres to partial retention, and 402,000 acres to retention standards.

Variations from the Standard Model

In order to ensure that the Alternative D FORPLAN model accurately reflected the Alternative's intent, allocation of land shown in Table B-39 were used to derive constraints in the model and delineate analysis areas. The management areas listed in the first part of Table B-39 are not directly entered into the FORPLAN model as a management emphasis. Instead the management areas are broken down in terms of their allowed harvest rate and these harvest rates become the management emphasis.

Table B-39. Alternative D Major Land Allocations

Management Area	Possible Harvest Rates	Acres
Timber	12+%	497,525
Visual	5%, 7%, 10%, 12%	313,965
Recreation	No harvest, 5%, 7%, 10%	253,156
Wilderness	No harvest	380,805
Wildlife	No harvest	162,245
Riparian	No harvest, 5%	47,991
Other	No harvest	25,937
Management Emphasis	**Level 7 FORPLAN Identifier**	**Acres**
5% harvest rate	55	81,310
7% harvest rate	77	52,834
10% harvest rate	10	118,190
12% harvest rate	12	91,058
Timber (12+%)	TI	445,481
No Harvest	00	876,535

Common Constraints

Descriptions of these constraints can be found earlier in this section under Description of Common Constraints. The standard sets of riparian, snags, wildlife, and harvest dispersion constraints were applied in the Alternative D model. Visual and recreation constraints were also present in the Alternative D model. These constraints limit harvest on different management areas with visual or recreation emphasis to rates of either 5%, 7%, 10%, or 12% consistent with the alternative objectives. The standard first-period maximum thinning acreage constraint was included in the model. The Alternative D model limits the harvest of timber to within 95% of CMAI by restricting the earliest age for harvest. The internally computed long-term sustained yield constraint and the perpetual timber harvest constraint were also applied in the model.

Unique Class I and Class II Riparian Constraints

Purpose - The purpose of these constraints was to prohibit timber harvest in riparian areas around Class I and Class II streams.

Rationale - By prohibiting the harvest of timber in these areas, water and fish habitat quality are maintained or improved meeting the alternatives objectives.

Tradeoffs - Application of these constraints improves water quality and riparian habitat for many wildlife species. Final harvest acres are, however, reduced in these areas, thereby reducing total timber volume and present net value.

Application - This condition was represented in the model by shifting all acres normally allocated to riparian harvest prescriptions to analysis areas which prohibit timber harvesting.

Unique Class III Riparian Constraints

Purpose - The purpose of these constraints was to limit the final harvest rate on Class III streams to 5% per decade.

Rationale - By limiting the harvest of timber in riparian areas around Class III streams and lakes, water and fish habitat quality are maintained or improved meeting the alternative's objectives.

Tradeoff - Application of these constraints improves water quality and riparian habitat for many wildlife species. Final harvest acres are reduced, thereby reducing total timber volume and present net value.

Application - Because the Class III riparian constraints were similar to the visual and recreation constraints, these constraints were incorportated into the standard set of visual and recreation constraints.

Unique Aggregated Recovery Percentage (ARP) Constraint

Purpose - The purpose of this constraint is to protect streambank and stream channel stability through the dispersal of harvest units.

Rationale - These constraints are a method to meet Alternative D goals and objectives for maintaining or improving water quality.

Tradeoff - These constraints were applied for decades 2 through 15; therefore, first-period timber harvest was not affected. These cosntraints did, however, limited the prescriptions chosen by the model, lowering final harvest acres and timber volume for future decades.

Unique Wildlife Constraints

Purpose - In addition to the MRs (see previous subsection Description of Common Constraints) the purpose of these constraints was to model the following wildlife objectives:

- Provide suitable habitat exceeding MRs for the northern spotted, pileated woodpecker, and marten.
- Provide 6 additional bald eagle areas with no harvest prescriptions.
- Increase habitat effectiveness on winter range for deer and elk, reducing the risk of winter mortality.

Rationale - These acreage constraints prevent the model from harvesting in wildlife habitat areas, thereby decreasing the risk of winter mortality.

Tradeoff - These first-period constraints provide higher quality habitat for a diverse array of wildlife species. However, when applied, these constraints reduce final harvest acres and consequently volume harvested.

Unique Snag Constraints

Purpose - To achieve a level of habitat quality for PCE equivalent to 60% of the biological potential.

Rationale - Addition of these constraints allows improved habitat quality for PCE consistent with Alternative D goals and objectives.

Tradeoff - This constraint does not reduce the final harvest acres but reduces the volume of timber removed from final harvest acres.

Alternative L

Purpose of the Alternative

Alternative L places a high emphasis on nonmarket values and low emphasis on timber commodity values. This alternative preserves areas currently not highly affected by past management activities in their natural condition and proposes other areas for natural recovery from the effects of past management. Alternative L was formulated with input from the Oregon Natural Resources Council (ONRC).

A detailed description of the Alternative L goals and objectives is found in Chapter II, Alternative Goals and Management Objectives, FEIS. Several of the major goals and objectives are summarized below:

- Provide the maximum amount of motorized and nonmotorized area for semiprimitive recreation opportunities.
- Emphasize a high level of scenic quality throughout the Forest.

- Maintain all inventoried roadless in an undeveloped condition and recommend several roadless areas to Wilderness status.
- Provide for full timber yields on 314,000 acres and reduced level of timber production on 239,000 acres.
- Provide suitable habitat that would exceed MRs for the northern spotted owl, pileated woodpecker, and marten.
- Manage riparian areas above minumum level for water quality to aid in the recovery of current stream conditions and to meet objectives for other riparian resources.

Alternative Criteria and Assumptions

The following assumptions were made during the formulation of the Alternative L model:

- Timber harvest is scheduled only on lands classified as suitable for timber harvest.
- Timber harvest cannot exceed the long-term sustained yield capacity in any decade.
- Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long-term sustained yield capacity.
- Timber harvest cannot decrease in any decade when compared to the immediately preceding decade (NDY).
- Regeneration harvests cannot be scheduled until stands have reached 95% of CMAI.
- Objective function used is to maximize timber volume for the first decade harvest.

Relationships to Issues and Benchmarks

Alternative L addresses the roadless area planning issue by maintaining all 145,900 acres, or 85%, of the inventoried roadless areas on the Forest as roadless. Alternative L maintains the greatest amount of roadless areas of any alternative or benchmark. This level of roadless area maintenance is in contrast to the maximum present net value and maximum timber volume benchmarks which retain no roadless areas.

Alternative L harvests 26.4 million cubic feet (MMCF) of timber during the first period. This is in contrast to the maximum timber benchmark which harvests 118.1 MMCF of timber in the first decade, and the minimum management benchmark which harvests no timber in any decade.

The wildlife and fish habitat issues are addressed directly in Alternative L. The full spotted owl habitat area inventory outside of Wilderness (184 areas) is provided in this alternative. Effective habitat for deer and elk would be provided by designating High, Moderate, and Low Emphasis Areas. With Alternative L winter range would be 41% high emphasis, 42% moderate emphasis, and 17% low emphasis. No benchmarks maintain effective habitat through the use of Emphasis Areas. Alternative D allocates 66% to high emphasis, 21% to moderate emphasis, and 14% to low emphasis.

Dispersed recreation is provided in Alternative L by allocating 102,000 acres to semiprimitive nonmotorized recreation and 66,300 acres to semiprimitive motorized recreation. These levels can be

compared to the maximum recreation benchmark which allocates 229,446 acres to semiprimitive nonmotorized recreation and 48,489 acres to semiprimitive motorized recreation, or the maximum PNV benchmark which does not to allocate any acreages to either of these categories.

The scenic quality issue is addressed directly in Alternative L. Alternative L allocates 4,500 acres to modification standards, 286,300 acres to partial retention standards, and 265,100 acres to retention standards. These levels are in contrast to the maximum present net value benchmark which does not allocate any Forest acres to visual management and the recreation benchmark which allocates 565,000 acres to modification standards, 4,000 acres to partial retention, and 402,000 acres to retention standards.

Variations from the Standard Model

To ensure that the Alternative L FORPLAN model accurately reflected the alternative's intent, the allocations of land shown in Table B-40 were used to derive constraints in the model and delineate analysis areas. The management areas listed in the first part of Table B-40 are not directly entered into the FORPLAN model as a management emphasis. Instead the management areas are broken down in terms of their allowed harvest rate and these harvest rates become the managment emphasis.

Alternative L is the only alternative that differs in the established harvest rates. This alternative makes use of the harvest rates used in previous alternatives and in addition uses 1%, 4%, and 6% harvest rates.

Table B-40. Alternative L Major Land Allocations

Management Area	Possible Harvest Rates	Acres
Timber	10%, 12+%	195,190
Visual	No harvest, 1%, 4%, 5%	358,088
Recreation	No harvest, 5%, 7%,	401,004
Wilderness	No harvest	550,165
Wildlife	No harvest, 3%	92,146
Riparian	No harvest	43,600
Other	No harvest	22,077
Management Emphasis	**Level 7 FORPLAN Identifier**	**Acres**
1% harvest rate	11	11,774
3% harvest rate	33	64,886
4% harvest rate	44	65,739
5% harvest rate	55 F	25,212
6% harvest rate	66	50,979
7% harvest rate	77	25,383
10% harvest rate	10	179,748
Timber (12+%)	TI	142,484
No Harvest	00	1,113,063

Common Constraints

Complete descriptions of the common constraints sets applied in Alternative L model are found in Appendix B, Description of Common Constraints. The standard sets of wildlife, snags, riparian, and

harvest dispersion constraints were applied in the Alternative L model. Visual and recreation were also present in the Alternative L model. These constraints limit harvest on areas of visual and recreation emphasis to rates of either 1%, 3%, 4%, 5%, 6%, 7%, or 10%. The standard first-period maximum thinning acreage constraint was also included in the model. The Alternative L model limits the harvest of timber to within 95% of CMAI by restricting the earliest age available for harvest. The internally computed long-term sustained yield constraint, nondeclining yield, and the perpetual timber harvest constraint were also applied in the model.

Unique Class I, II, III, and IV Constraints

Purpose - The purpose of these constraints is to prohibit timber harvest around Class I, II, III, and IV streams and lakes.

Rationale - By prohibiting the harvest of timber in these areas, water quality and fish habitat quality are maintained or improved, meeting the alternative objectives.

Tradeoff - A majority of these acres were removed from the timber base (the exception being those acres removed for MRs), directly reducing the final harvest acres and volume harvested.

Application - This condition was represented in the model by shifting all acres normally allocated to the standard riparian harvest prescription to the riparian no harvest analysis areas.

Unique Aggregated Recovery Percentage Constraint

Purpose - The purpose of this constraint is to protect streambank and stream channel stability as a method of maintaining or improving water quality.

Rationale - To meet Alternative L goals and objectives for maintaining or improving water quality.

Tradeoff - These constraints were applied for decades 2 through 15; therefore, first-period timber harvest was not affected. These constraints limited the prescriptions chosen by the model, lowering final harvest acres and timber volume for future decades.

Unique Timber Harvesting Constraint

Purpose - The purpose of this constraint is to limit harvest to rates between 1% and 10% thereby lengthening rotation.

Rationale - To meet the alternative goals and objectives for maintaining connectivity and old-growth characteristics in forested stands.

Tradeoff - Maintaing an interconnection of high quality habitats provides a healthy environment for the growth of a diverse array of wildlife populations. When these constraints are applied, however, there is a drastic reduction in final harvest acres and volume, resulting in a decrease in PNV.

ESTIMATING EFFECTS OF BENCHMARKS, DISCRETIONARY CONSTRAINTS, AND ALTERNATIVES

The purpose of identifying and estimating the effects of each benchmark, alternative, and discretionary constraint was to find the most cost efficient means of addressing planning issues. A comparative analysis among alternatives is the basis for evaluating alternatives and selecting a preferred alternative. This section focuses on the differences among alternatives in terms of outputs and effects, objectives and constraints, and economic efficiency of alternatives. Some key items of the benchmarks are also discussed as a reference points for explaining these differences. For a more complete discussion of the rationale and tradeoffs of individual constraints see the previous section of this appendix, *Formulation of Alternatives*. See FEIS Chapter IV for a complete discussion of the environmental effects.

First, the process for evaluating constraints is discussed. Then, the alternatives are compared in terms of response to issues, concerns and opportunities (ICOs) and in terms of several economic criteria. In the final part of this section, the reasons for economic differences among the alternatives are compared with the differences between outputs and effects.

Process for Evaluating Significant Constraints

Management objectives of benchmarks and alternatives were achieved by constraining FORPLAN as described in the previous sections (*Analysis Prior to the Development of Alternatives* and *Formulation of Alternatives*). The opportunity cost of individual objectives can be determined by comparing a FORPLAN solution which achieves a specific objective with a solution which does not. When all other objectives are the same, the difference in outputs and effects is the opportunity cost of achieving the objective.

Opportunity costs were not determined for all individual alternative objectives because of the prohibitive costs of analyzing every constraint used to develop alternatives. Instead, the economic tradeoffs of sets of objectives were determined by comparing alternatives. These efficiency tradeoffs were then compared to environmental and social consequences to help identify the alternative which maximizes net public benefits.

During benchmark analysis, constraint sets which were needed to meet MRs were developed and evaluated. The constraints were analyzed both individually and collectively to determine the magnitude of their tradeoffs. The policy constraints associated with nondeclining yield and rotations based on CMAI were also evaluated to determine their effects on PNV and timber output levels. The results of the analyses of MRs and legal and policy constraints are presented in the *Analysis of the Management Situation*, Chapter II, and in Section F of this Appendix.

The tradeoffs discussed in this section are only relevant to the actual alternative where the objectives were analyzed because the opportunity costs are dependent on the order in which the objectives were added. For example, the economic tradeoff of meeting management objectives A and B can be determined by comparing FORPLAN solutions with various combinations of the two objectives. The changes in PNV due to meeting only A may be $5 million, and the change due to meeting B may be $11 million. However, taken together, the opportunity cost may not necessarily be the sum of A and B due to the degree to which these objectives overlap or duplicate themselves. In addition, the cost of meeting objective A in one alternative will not necessarily be the same as meeting the same objective in another alternative.

Economic Comparison of Alternatives and Benchmarks

Present Net Value

PNV is the primary measure of economic efficiency of the alternatives. It is the sum of priced values less all management costs discounted to the present at 4% per year. This analysis includes benefits and costs on the Forest as if the direction of each benchmark and alternative were to continue for 150 years, even though the period covered by a Forest Plan will be 10 to 15 years. For more explanation on the assumptions and procedures used to estimate economic consequences, see a previous section of this appendix, *Economic Efficiency Analysis*.

Table B-41 displays the incremental changes in PNV, and associated costs and benefits between alternatives and between benchmarks. The alternatives and benchmarks are ranked in order of decreasing PNV. The incremental changes in PNV are a measurement of the net economic values of the priced resources that would be foregone if a lower-ranked alternative is selected over a preceding one. The foregone economic value must be weighed against the nonpriced benefits of the alternative. Information on the benchmarks is included as reference points on the Forest resources under regimes which maximize the production of one resource or value.

The incremental changes in costs, benefits, and PNV of the alternatives and benchmarks are displayed again in Table B-42, only in order of increasing costs. The incremental changes in costs are a measure of the additional discounted cost that would be required to implement a more expensive alternative. The marginal cost must be weighed against the priced benefits and the nonpriced outputs and effects of the alternative.

The PNV of the alternatives range from $3.5 billion for Alternative K to $1.6 billion for Alternative L. In general, the PNV of alternatives and benchmarks vary with the amount of timber harvest in the 1st decade. The amount of timber harvest in the 1st decade ranges from 146.0 MMCF/year in Alternative K to 34.2 MMCF/year in Alternative L. The 1st decade harvest results from the objectives of the alternative which effect 1) the amount of land that would be suitable for timber production, 2) the objective of the timber program (whether to maximize PNV or to maximize the amount of volume available for harvest), and 3) the timber harvest flow objectives. Alternatives with less timber harvest would be less expensive to implement primarily because of fewer reforestation and road costs. However, in most alternatives, the expense of having a large timber and road program would be more than offset by additional receipts from timber sales.

Table B-41. Differences in Economic Efficiency Criteria [1]

Alternative/Benchmark, Ranked by Present Net Value [2]	Present Net Value [2]		Discounted Costs [2]		Discounted Benefits[2]	
	Total	*Change*	*Total*	*Change*	*Total*	*Change*
NC[3]	NA		NA		NA	
K	3,503	-319	3,370	-191	6,874	-511
A	3,184	-124	3,179	-383	6,363	-507
J	3,060	-202	2,796	-170	5,856	-8
W(PA)	2,858	-78	2,626	+32	5,848	-411
D	2,780	-1,173	2,658	-1,622	5,437	-2,795
L	1,607		1,036		2,642	
Maximum PNV	3,782	-303	3,365	-230	7,147	-73
Maximum Timber	3,479	-759	3,595	-1,685	7,074	-2,444
Recreation[4]	2,720	-1,860	1,910	-1,699	4,630	-3,500
Minimum Level[4]	860		211		1,130	

[1]4% discount rate over 150 years.
[2]In 1982 MM$.
[3]Comparable values are not available for Alternative NC.
[4]Shaded rows were not reanalyzed between DEIS and FEIS.

Table B-42. Differences in Economic Efficiency Criteria [1]

Alternative/Benchmark, Ranked by Increasing Discounted Costs [2]	Discounted Costs [2]		Discounted Benefits[2]		Present Net Value [2]	
	Total	*Change*	*Total*	*Change*	*Total*	*Change*
L	1,036		2,642		1,607	
		+1,590		+3,206		+1,251
W(PA)	2,626		5,848		2,858	
		+32		+411		-78
D	2,658		5,437		2,780	
		+138		+419		+2,780
J	2,796		5,856		3,060	
		+383		+507		+124
A	3,179		6,363		3,184	
		+191		+511		+319
K	3,370		6,874		3,503	
NC[3]	NA		NA		NA	
Minimum Level	**211**		**1,130**		**860**	
		+1,699		**+3,500**		**+1,860**
Recreation	**1,910**		**4,630**		**2,720**	
		+1,455		**+5,692**		**+1,062**
Maximum PNV	3,365		7,147		3,782	
		+230		-73		-303
Maximum Timber	3,595		7,074		3,479	

[1]4% discount rate over 150 years.
[2]In 1982 MM$.
[3]Comparable values are not available for Alternative NC.
[4]Shaded rows were not reanalyzed between DEIS and FEIS.

Discounted Costs and Benefits

Discounted benefits and costs by resource group are displayed in Tables B-43 and B-44. The discounted costs were reviewed and revised between the DEIS and FEIS to reflect current practices and the current accounting system. The costs developed in the DEIS were based on the Management Information Handbook (MIH) coding system. This system has been replaced by the National Activity Structure Handbook (FSH 1309.16). The cost structure was set up to be similar to the codes used by Forest Service managers in developing outyear budgets. The new cost information was incorporated in Alternatives K, A, J, W, D, and L, and the Timber and PNV benchmarks for the FEIS.

Discounted benefits range from $6.8 billion for Alternative K to $2.6 billion for Alternative L. Discounted costs range from $3.4 billion for Alternative K, to $1.0 billion for Alternative L. The discounted benefits exceed the discounted costs of all resource groups displayed on Tables B-43 and B-44 except for the "Other" category. The "Other" category would have a negative net value because these programs (primarily general administration, facilities, and protection) have few benefits which have been assigned dollar values.

In all alternatives except Alternative L, timber receipts would contribute about 3/4 of the discounted benefits and timber would account for 60% of the discounted costs. Timber receipts would contribute 48% of the discounted benefits in Alternative L and timber would account for 50% of the discounted costs in Alternative L.

For the timber program the discounted benefits would more than compensate for increases in discounted costs among both alternatives and benchmarks. Other programs, such as recreation, involve changes in quality of the recreation experience which are not all captured in dollar values assigned to recreation use. Thus the dollar benefit values for recreation, fish and wildlife do not always compensate for additional costs and the ranking by costs and benefits does not follow the ranking by PNV. Neither benchmarks nor Alternatives J, W, and D would not be in the same location if the ranking were based on discounted costs. Alternative D makes the largest investments in both wildlife habitat improvements and recreation. Between Alternatives W and J, Alternative W makes the largest investment in recreation facilities. Alternative J makes the largest investment in wildlife habitat improvements.

The recreation, wildlife and fish programs would contribute smaller, but significant positive economic value in all alternatives. The costs of the recreation and wilderness management programs would increase with the amount of land managed for undeveloped and Special Interest Areas and investment in recreational facilities. In all alternatives recreational demand above capacity levels is not valued. Benefits for wildlife and fish would vary primarily with the level of elk habitat and riparian protection, respectively. Costs for wildlife and fish vary primarily from investment in habitat improvement.

Benchmarks also follow the same pattern. The maximum Timber Benchmark incurs greater costs the the PNV Benchmark due to practicing the highest intensity of management on all lands to obtain maximum volume. In contrast the maximum PNV Benchmark incurs cost only on those lands which reap the highest net benefit.

The economic benefits and costs discussed here do not include possible future mineral and energy development. These values are highly speculative because of the low potential for significant development on the Forest. The economic consequences of such unlikely developments would probably not vary significantly between alternatives.

Table B-43. Present Net Value, Discounted Benefits, and Discounted Costs By Resource [1]

	ALTERNATIVE, Ranked in Order of Decreasing PNV						
	NC	K	A	J	W	D	L
DISCOUNTED BENEFITS [2] (MM$)							
Present Net Value	N/A	3,503	3184	3,060	2,858	2,780	1,607
Timber	N/A	5,465	5,123	4,520	4,131	4,010	1,281
Recreation	N/A	1,408	1,239	1,335	1,353	1,427	1,361
Wildlife and Fish[3]	N/A	NE	NE	NE	NE	NE	NE
Other[4]	N/A	0.8	0.8	0.8	0.8	0.8	0.8
DISCOUNTED COSTS[2] (MM$)							
Timber	N/A	2,323	2,218	1,915	1,785	1,814	513
Facilities[5]	N/A	403	376	354	328	284	195
Recreation	N/A	145	113	125	140	170	134
Wildlife and Fish	N/A	141	130	103	96	110	78
Other[6]	N/A	359	342	299	278	280	114

1 4% discount rate over 150 years.

2 Comparisons of benefits and costs displayed for individual resource outputs indicate general relationships between alternatives, but they may be misleading because many outputs of multiple use management have common costs of production that cannot be attributed to individual resources.

3 Fish and wildlife related programs were not individually computed for the FEIS, but have been included with recreation.

4 Receipts from mineral leases, special uses, recreation user fees, grazing, land uses, and power.

5 Primarily road construction, reconstruction, and maintenance related to timber management.

6 Costs are for all other programs not elsewhere classified.

Table B-44. Present Net Value, Discounted Benefits, and Discounted Costs By Resource [1]

BENCHMARK, Ranked in Order of Decreasing PNV					
	Current Direction (No Action)	PNV	Timber	Recreation[2]	Minimum Level[2]
DISCOUNTED BENEFITS [3] (MM$)					
Present Net Value	3,184	3,782	3.479	2,720	860
Timber	5,123	5,738	5,665	2,850	0
Recreation	1,234	1,403	1,403	1,310	831
Wildlife and Fish[4]	N/A	N/A	N/A	N/A	N/A
Other [5]	0.8	0.8	0.8	0.0	0.0
DISCOUNTED COSTS [3] (MM$)					
Timber	2,218	2,320	2,378	1,364	2
Roads	NE[6]	NE[6]	NE[6]	139	20
Facilities[7]	376	403	403	NE[6]	NE[6]
Recreation	113	143	146	175	30
Wildlife and Fish	130	139	143	8	3
Other [8]	718	2,678	2,823	221	215

1 4% discount rate over 150 years.
2 Shaded columns were not reanalyzed between DEIS and FEIS.
3 Comparisons of benefits and costs displayed for individual resource outputs indicate general relationships between alternatives, but they may be misleading because many outputs of multiple use management have common costs of production that cannot be attributed to individual resources.
4 Fish and wildlife related programs were not individually computed for the FEIS.
5 Receipts from mineral leases, special uses, recreation user fees, grazing, land uses, and power.
6 These values were not individualy computed
7 Primarily road construction, reconstruction, and maintenance related to timber management.
8 Costs are for all other programs not elsewhere classified.

Trade-Offs Among Alternatives

This section summarizes the relationships among economic values and the responses of the alternatives to selected issues. The purpose is to highlight major economic and noneconomic trade-offs that can be quantified by using indicators of responsiveness to issues as a means of comparing alternatives. A complete understanding of the differences among alternatives requires reading Chapter II, IV, and Appendix B. The issues are discussed in detail in Chapter I and Appendix A.

To provide a partial framework for assessing trade-offs, the long-term resource demands of the nation, region, and local communities are briefly summarized. Selected economic values and quantified indicators of responsiveness to issues are then tabulated. Finally, differences and similarities among individual alternatives are summarized in terms of major trade-offs among competing objectives or responses to issues.

National, Regional, and Local Overview

The 1984 supplement to the Resources Planning Act (RPA) Assessment estimates that total national demands will rise for all goods and services produced by the National Forests. At the same time, there will be a continuing strong desire to protect and enhance the quality of the environment.

The Regional Guide for the Pacific Northwest Region estimates that demands for all outputs of the National Forests will also rise in Oregon and Washington. Recreation use is expected to increase as the population increases and its characteristics change, with the bulk of recreation use coming from residents of the region. Demand for Wilderness recreation is expected to exceed the available supply within the Region's Wilderness Preservation System.

A survey of recreation associated with fishing, hunting, and wildlife (USDI 1988) indicates that more than three of every four Americans pursue some type of fish or wildlife activity. Demand for hunting and sport fishing is expected to increase by one-third between 1985 and 2000. Nonconsumptive uses of wildlife and fish are also expected to increase.

The National Forests of the Pacific Northwest are the National Forest System's primary timber producer, with almost one-half of the current National Forest harvest coming from this region. The quantity of timber demanded regionally in 2000 is expected to be about 1% greater than the 1976 demand level. The stumpage price of timber, however, is expected to rise substantially.

The local situation is generally similar to that of the Region. Many of the Wilderness and non-Wilderness areas providing primitive and semiprimitive recreation opportunities are currently being used at levels which exceed their capacity to provide high quality experiences. The demand for this type of recreation on the Forest is expected to increase over the next 10 to 50 years.

Demand for timber from the Forest is also projected to increase over the next 10 to 15 years due to anticipated reductions in supply from private and other public lands in the central and southern Willamette Valley together with a strong market for wood products and fiber.

Growth in the recreation and tourism sectors of local and regional economies will add to the economic base, while the timber industry will remain a significant component of the area economy. These trends are discussed more thoroughly in the social and economic environment and timber sections of Chapter III of the FEIS.

Economic Values and Response to Major Issues, Concerns, and Opportunities

Alternatives are developed to provide different responses to public issues identified on the Forest. This section summarizes the quantifiable differences among alternatives in terms of economic criteria and responses to major issues. These issues are discussed in detail in Chapter I. A complete discussion of these indicators and their relationship to the major issues can be found in Appendix A, *Issues, Concerns, and Opportunities Identification Process*.

The response of the alternatives to the ICOs or group of ICOs is summarized in Table B-45. The items on the table are key indicators of the degree of response to the 12 major ICOs (additional indicators are given in Chapter I). The first 7 indicators resulted from an in-depth analysis of the public responses received in early 1981 and continued to be of highest concern during the comment period on the DEIS. The "other" indicators were selected because they reflect quantifiable social and economic effects of both local and national concern.

The issues and associated indicators of responsiveness include:

- Dispersed Recreation

  Land allocated to semiprimitive nonmotorized uses.
  Land allocated to semiprimitive motorized uses.
  Land allocated to Special Interest Areas.
  Trail construction in the 1st decade.

- Old-Growth

  Amount of old-growth/mature timber retained at the end of the 1st decade.

- Roadless Lands

  Acres of roadless areas left undeveloped.

- Scenic Quality

  Land allocated to a retention Visual Quality Objective.
  Land allocated to a partial retention Visual Quality Objective.
  Land allocated to a modification Visual Quality Objective.

- Timber Supply

  Allowable sale quantity in the 1st decade.
  Long-term sustained yield.

- Water

  Forest area with a "High" Risk watershed risk rating.
  Forest area with a "Moderate" Risk watershed risk rating.
  Forest area with a "Low" Risk watershed risk rating.
  Erosion in the 1st decade (debris slides).

- Wildlife, Fish, and Plant Habitat

  Land managed as spotted owl habitat areas.
  Elk population in the 1st decade.
  Deer population in the 1st decade.

Other indicators of both local and national concern include those which reflect the social and economic effects of alternatives. The quantifiable indicators of these concerns include:

- Present net value over 15 decades.
- Change in jobs in the 1st decade.
- Change in income in the 1st decade.
- Change in payments to counties in the 1st decade.
- Average annual net cash flow in the 1st decade.

Table B-45 displays the data for each indicator for all the alternatives.

Table B-45. Tradeoffs of Economic Benefits and Indicators of Response to Issues

Issues	Max PNV Bench -mark	Units	NC	K	A	J	W	D	L
Economics									
PNV	3.8	$MMM	NA[3]	3.5	3.2	3.1	2.9	2.8	1.6
Cash Flows 1st decade	85.5	$MM/Yr	NA	66	62	54	52	42	6
5th decade	82.0	$MM/Yr	NA	88	79	86	72	52	6
Noncash Benefits 1st Decade	40.2	$MM/Yr	39	40	41	41	40	38	41
5th decade	71.2	$MM/Yr	NA	71	53	60	62	74	63
Payments to Counties	36.6	$MM/Yr	39	32	30	27	25	23	8
Changes in Income[1]	80.5	MM/Yr	156	74	53	14	-6	-15	-173
Changes in Jobs[1]	2665[2]	Number	5653	2945	2218	900	204	-167	-5499
Timber									
ASQ[7]	660	MMBF	810	650	608	530	491	476	150
ASQ[7]	113	MMCF	146	117	110	95	87	86	27
Long-Term Sustained Yield	123	MMCF	146	120	114	108	95	94	34
Recreation									
Special Interest Areas	NE[2]	M Acres[4]	1.1	2.8	1.1	22.6	31.1	15.2	3.4
Trail Construction[7]	NE[2]	Miles	0	0	0	4.0	6.0	6.8	4.0
Semiprimitive Nonmotorized		M Acres[4]	75.3	14.4	72.2	89.5	85.8	176.5	102.0
Semiprimitive Motorized		M Acres[4]	23.9	48.3	23.4	31.3	36.0	38.2	66.3
Water									
Low Watershed Risk[5]	NE[2]	% Area	NA	41	47	65	100	78	100
Moderate Watershed Risk[5]	NE[2]	% Area	NA	27	25	17	0	10	0
High Watershed Risk[5]	NE[2]	% Area	NA	29	28	18	0	12	0
Erosion (Debris Slides)[7]	NE[2]	M C.Yds	NA	85.6	80.3	67.0	28.5	33.4	23.9
Wildlife									
Spotted Owl Habitat	59	# Areas[4]	0	59	59	59	59	102	184
Elk Population	NE[2]	M Elk[6]	NA[3]	3.7	4.2	4.5	4.8	5.6	5.6
Deer Population	NE[2]	M Deer[6]	NA[3]	17.8	19.5	23.1	24.9	28.4	26.6
Scenic Quality									
Retention		M Acres[4]	88.6	72.0	77.9	90.5	118.8	142.1	265.1
Partial Retention		M Acres[4]	114.3	147.5	150.1	177.7	171.7	246.7	286.3
Modification		M Acres[4]	4.5	123.6	4.5	206.2	143.0	108.4	4.5
Old Growth									
Acres Remaining After 10 Years	520.7	M Acres	494.0	522.4	528.4	534.9	533.4	537.2	578.3
Roadless									
Area Allocated to Roadless	0	M Acres[4]	45.4	25.3	59.8	79.7	92.1	136.9	145.9

[1]Changes represent the total potential change in the 1st decade as compared to the historical average (1980-1989)
[2]NE = Not estimated, benchmarks were not analyzed as fully developed implementable alternatives.
[3]NA = Data Not Available; could not be reasonably estimated, or compared to other alternatives, since Alternative NC (No Change) is based on a significantly different set of assumptions than the other Alternatives, and could not be modeled with the current Forest FORPLAN model. See alternative Considered in Detail, Chapter II for additional information.
[4]Represents lands allocated to meet this objective.
[5]Percent of total Forest area at the end of the 1st decade in this watershed risk category. See Chapter IV, Water for further explanation.
[6]Represents end of 1st decade conditions.
[7]Units are average annual for 1st decade.

Differences and Similarities Among Alternative

This section describes the major differences and similarities among alternatives in terms of the indicators of responsiveness listed in the previous section. The major factors influencing the economic indicators are described in *Response to Issues and Concerns*, Chapter II. More details on the outputs and effects of the alternatives can be found in the individual resource sections in Chapter IV. Table B-45 contains data used for these discussions; Tables II-24 through II-26 in Chapter II may also provide some supplemental information. The alternatives are described in order of decreasing present net value (PNV). The indicators for each issue are discussed sequentially for each alternative. Information for the maximum PNV benchmark is provided only as a reference point. Qualifiers such as low or high used in these discussions are relative to the upper and lower level of each output shown in Table B-45.

While each alternative would meet MRs, multiple use requirements, and sustained yield requirement, the goal of each alternative is to benefit one or more resources outputs. To achieve this, other resource outputs must be reduced or "traded off". Those tradeoffs are discussed here by focusing on the incremental differences between the alternatives, starting with the alternative which has the highest PNV. The focus of the discussion is on 1) reasons for differences in economic values and 2) differences which are not fully reflected in the PNV. Alternatives are compared with the other alternatives and with the PNV benchmark. The accompanying table uses summarizes the tradeoffs associated with achieving a higher PNV. For a detailed discussion the Roadless, Water and Vegetation sections of Chapter IV describe the relationship of these effects in more detail.

The indicators that could be estimated for the No Change Alternative are displayed in Table B-45 and are described in this section. Many indicators could not be reasonably estimated because Alternative NC (No Change) is based on a set of assumptions different than were the other alternatives and could not be modeled with the current Forest FORPLAN model. *Alternatives Considered In Detail*, Chapter II describes these differences.

Most of the variation in economic response factors described in *Response to Issues and Concerns*, Chapter II, can be directly related to the amount of timber harvest in an alternative. This pattern does vary somewhat as a result of the level of recreation oriented benefits provided by an alternative. Alternatives with greater emphasis on recreation have higher levels of recreation benefits. Jobs and personal income variations among alternatives follow the same kinds of patterns as the other economic indicators.

Maximum PNV Benchmark - PNV: $3.8 Billion - Opportunity Cost: None (Baseline for Comparison)

The Maximum PNV Benchmark identifies the mix of goods and services with market and assigned values that result in the largest excess of discounted benefits over discounted costs. It meets MRs for resource protection and produces a high level of timber harvest on a nondeclining yield schedule. It is summarized in Table B-45 for comparison purposes.

Alternative NC (No Change) - PNV: NOT AVAILABLE - Opportunity Cost: NOT AVAILABLE

Alternative NC would produce the highest level of timber of any alternative (allowable sale quantity of 146 million cubic feet annually). This figure represents the potential yield from the current Forest Land and Timber Management Plan (1977). Although many indicators were not estimated for this alternative, present net value, net cash flows, payments to counties, income, and jobs would all likely be at their highest level with this alternative due to the high level of timber harvest. Conversely, the amount of old growth remaining at the end of the 1st decade would be at the lowest level of any alternative.

Forest land allocations for dispersed recreation, roadless areas, and scenic management areas are those in the current Forest Plan (1977) and are intermediate within the range of alternatives. Since MRs are not a part of this alternative, spotted owl habitat areas would be located only where some other allocation prohibited timber harvesting. Consequently, they are at their lowest level with this alternative. Deer and elk populations were not estimated for this alternative. Although quantitative estimates of watershed impact ratings and erosion were not made for this alternative, the amount of land in the "high" watershed risk category, and the amount of erosion would likely be at their highest level due to the high timber harvest level.

Table B-46 summarizes the tradeoffs of Alternative NC with the PNV Benchmark.

Table B-46. Comparison of Alternative NC with PNV Benchmark

Selected Issues	Units	Alt NC	Change From PNV Benchmark
PNV	$MMM	NA[3]	NA[3]
Non-cash Benefit	$MM/Yr	39	0
ASQ[1]	MMBF	810	+ 150
ASQ[1]	MMCF	146	+ 33
LTSY	MMCF	146	+ 23
Changes in Jobs[2]	Number	5653	+2988
Old Growth Remaining After 10 Years	M Acres	494	- 27

[1] Units are average annual for 1st decade

[2] Changes represent total potential change in the first decade as compared to the historical average (1980-1989)

[3] Data not available

Alternative K (Willamette Forestry Council) - PNV: $3.5 Billion - Opportunity Cost: $297 Million as compared to Maximum PNV

With the exception of Alternative NC, Alternative K would produce the highest level of timber of any alternative on a nondeclining yield schedule (117 million cubic feet annually in the 1st decade). This is 29 million cubic feet or 20% less than the harvest level under Alternative NC because of land allocations and application of management prescriptions to meet MRs for water, soil, and wildlife resources. The areas available for spotted owl habitat would increase by 14 for a total of 59 areas in Alternative K. As a result of the lower timber harvest levels, all of the economic indicators are correspondingly lower also. The acres of old growth left at the end of the 1st decade would be 522.4 M acres or 28.4 M acres more than Alternative NC.

The number of Forest acres allocated to dispersed recreation and roadless area retention are similar to Alternative NC, overall. There is, however, an increase in Alternative K of acres managed to meet a modification visual objective. Although watershed risk was not estimated for Alternative NC, based on the rate of harvest it is likely the effects would be similar to Alternative K; 29% of the Forest in the high risk category and 27% of the area at moderate risk of adverse watershed impacts.

Table B-47 summarizes the tradeoffs associated with Alternative K with respect to the PNV Benchmark and Alternative NC.

Table B-47. Comparison of Alternative K with PNV Benchmark and Alternative NC

Selected Issues	Units	Alt K	Change From PNV Bench-mark	Change From Alt NC
PNV	$MMM	3.5	- 0.3	NA[3]
Non-cash Benefit	$MM/Yr	40	+ 1	+ 1
ASQ[1]	MMBF	650	- 10	- 160
ASQ[1]	MMCF	117	+ 4	- 29
LTSY	MMCF	120	- 3	- 26
Changes in Jobs[2]	Number	2945	+280	-2708
Old Growth Remaining 1st Decade	M Acres	522.4	+ 1.7	+ 28.0

[1] Units are average annual for 1st decade
[2] Changes represent total potential change in the first decade as compared to the historical average (1980-1989)
[3] Data not available

Alternative A (No Action) - PNV: $3.2 Billion - Opportunity Cost: $319 Million as compared to Alternative K.

Alternative A would continue management of the Forest under the existing Forest Land and Timber Management Plan (1977); however, Forest direction is modified in this Alternative to meet MRs. The timber harvest under Alternative A, 110 million cubic feet, is a decrease of 7 million cubic feet per year from the harvest level under Alternative K. Present net value, payments to counties, and net cash flow drop slightly from the Alternative K level. Income and the number of jobs decrease proportionally with the timber harvest levels. Alternative A would retain 528.4 M acres of old growth at the end of the first decade or 6 M acres more than in Alternative K.

Forest land allocations for dispersed recreation, roadless areas, and scenic management areas (with the exception of Modification in K) are higher in Alternative A as compared to Alternatives K and NC. Spotted owl habitat areas would be protected at the MR level or the same level as Alternative K. Deer and elk populations in Alternative A would show a slight increase over Alternative K. Elk populations increase in Alternative A as compared to Alternative K due to a better balance of cover and forage habitat components and overall habitat quality. The watershed risk levels are similar between Alternatives K and A with over 50% of the Forest at high to moderate risk of adverse watershed effects.

Table B-48 summarizes the tradeoffs associated with the Alternative A with respect to the PNV Bechmark and Alternative K.

Table B-48. Comparison of Alternative A with PNV Benchmark and Alternative K

Selected Issues	Units	Alt A	Change From PNV Benchmark	Change From Alt K
PNV	$MMM	3.2	- 0.6	- 0.3
Non-cash Benefit	$MM/Yr	41	+ 2	+ 1
ASQ[1]	MMBF	608	- 52	- 202
ASQ[1]	MMCF	110	- 3	- 7
LTSY	MMCF	114	- 9	- 32
Changes in Jobs[2]	Number	2218	-447	-3435
Old Growth Remaining 1st Decade	M Acres	528.4	+ 7.7	+ 6.0

[1] Units are average annual for 1st decade

[2] Changes represent total potential change in the first decade as compared to the historical average (1980-1989)

Alternative J (DEIS Preferred) - PNV: $3.1 Billion - Opportunity Cost: $124 Million as compared to Alternative A.

Alternative J was formulated to provide relatively high levels of timber on a nondeclining yield basis in combination with production of amenity resources at intermediate levels. Timber harvest would be 95 million cubic feet annually. This level is 15 million cubic feet or 14% less than the first decade annual harvest in Alternative A. The difference in timber harvest between these two alternatives is due to more acres that would be managed for nontimber uses such as dispersed recreation and additional acres of reduced yields such as Retention and Partial Retention scenic objectives. Present net value, net cash flows, payments to counties, personal income, and the number of jobs are less in the first period as compared to Alternative A reflecting the increased emphasis on amenity resources. In Alternative J, 534.9 M acres of old growth or 6.5 M additional acres would remain under Alternative J after 10 years as compared to Alternative A. The amount of existing roadless area allocated to roadless prescriptions is 20 M acres greater in Alternative J than in A. The amount of new trails that would be built in Alternative J is 40 miles over the decade, as compared to no new trail construction in Alternative A.

Deer and elk populations increase slightly in Alternative J reflecting the increased amounts of optimum cover and other habitat enhancements. Spotted owl habitat would be provided at the MR level of 59 areas, unchanged from Alternative A. The lower first decade harvest level in Alternative J results in a 35% of the Forest area in a high or moderate risk category for adverse watershed effects as compared to 55% in the same categories in Alternative A.

Table B-49 summarizes the tradeoffs associated with Alternative J with respect to the PNV Benchmark and Alternative A.

Table B-49. Comparison of Alternative J with PNV Benchmark and Alternative A

Selected Issues	Units	Alt J	Change From PNV Benchmark	Change From Alt A
PNV	$MMM	3.1	- 0.7	- 0.1
Non-cash Benefit	$MM/Yr	41	+ 2	0.0
ASQ[1]	MMBF	530	- 130	- 78
ASQ[1]	MMCF	95	- 18	- 15
LTSY	MMCF	108	- 15	- 6
Changes in Jobs[2]	Number	900	-1765	-1318
Old Growth Remaining 1st Decade	M Acres	534.9	+ 14.2	+ 6.5

[1] Units are average annual for 1st decade

[2] Changes represent total potential change in the first decade as compared to the historical average (1980-1989)

Alternative W (FEIS Preferred) - PNV: $2.9 Billion - Opportunity Cost: $202 Million as compared to Alternative J.

Alternative W emphasizes the management of both commodity and noncommodity resources on the Forest at levels that would recognize the importance of maintaining intact, functional ecosystems and long term productivity. The timber harvest level in Alternative W would be 87 million cubic feet or 8% less than in Alternative J. Cash flows and payments to counties are only slightly less than in Alternative J, but other economic indicators show significant reductions. Spotted owls would be managed at the MR level of 59 areas, the same as Alternative J.

The amount of the Forest at high to moderate risk of adverse watershed effects decreases to 0%, a significant change from Alternative J. In addition, 12.4 M additional acres would be managed in a roadless condition. The amount of trails to be constructed in the first decade increases by 20 miles over the amount proposed in Alternative J to a total of 60 miles in Alternative W. Overall, the dispersed recreation opportunities in Alternatives J and W are similar. The acres of old growth remaining after 10 years shows a slight reduction (1,500 acres) from Alternative J. Elk and deer populations would increase slightly from Alternative J as a result of increased acres of optimal cover and additional emphasis on habitat management.

Table B-50 summarizes the tradeoffs associated with Alternative W with respect to the PNV Benchmark and Alternative J.

Table B-50. Comparison of Alternative W with PNV Benchmark and Alternative J

Selected Issues	Units	Alt W	Change From PNV Bench-mark	Change From Alt J
PNV	$MMM	2.9	- 0.9	- 0.2
Non-cash Benefit	$MM/Yr	40	+ 1	1
ASQ[1]	MMBF	491	- 169	- 39
ASQ[1]	MMCF	87	- 26	- 8
LTSY	MMCF	95	- 28	- 13
Changes in Jobs[2]	Number	204	- 2461	- 696
Old Growth Remaining 1st Decade	M Acres	533.4	+ 12.7	- 1.5

[1] Units are average annual for 1st decade

[2] Changes represent total potential change in the first decade as compared to the historical average (1980-1989)

Alternative D (Wildlife) - PNV: $2.8 Billion - Opportunity Cost: $78 Million as compared to Alternative W.

Alternative D places a high emphasis on the management of wildlife and other amenity resources. This level of management would require reductions in the acres where timber is the primary production goal. The timber sale level under Alternative D is 86 million cubic feet which is similar to Alternative W. First period jobs, personal income, payments to counties, net cash flow, and present net value are also reduced slightly compared to Alternative W. The old growth remaining at the end of the first decade would be 537.2 M acres or less than a 1% increase over Alternative W.

The increased emphasis on amenity resources would result in more acres allocated for semiprimitive nonmotorized dispersed recreation, scenic zones, roadless areas, and spotted owl habitat areas, as compared to Alternative W. The significant changes between Alternative W and Alternative D are in wildlife and watershed outputs and effects. In Alternative D, the number of designated spotted owl habitat areas is 102 compared to the MR level of 59 in Alternative W. Elk and deer populations would increase by 15 to 20% over Alternative W due to an emphasis on high quality habitat conditions and enhancement projects.

The amount of the Forest in the high to moderate risk category for adverse watershed effects increases from 0% in Alternative W to 22% in Alternative D. This increase is due largely to a harvest level similar to Alternative W on a smaller suitable land base and the decreased emphasis in Alternative D to maintain favorable watershed conditions at the subdrainage level.

Table B-51 summarizes the tradeoffs associated with Alternative D with respect to the PNV Benchmark and Alternative W.

Table B-51. Comparison of Alternative D with PNV Benchmark and Alternative W

Selected Issues	Units	Alt D	Change From PNV Benchmark	Change From Alt W
PNV	$MMM	2.8	- 1.0	- 0.1
Non-cash Benefit	$MM/Yr	38	- 1	- 2
ASQ[1]	MMBF	476	- 184	- 15
ASQ[1]	MMCF	86	- 27	- 1
LTSY	MMCF	94	- 29	- 1
Changes in Jobs[2]	Number	- 167	- 2832	- 371
Old Growth Remaining 1st Decade	M Acres	537.2	+ 16.5	+ 3.8

[1] Units are average annual for 1st decade

[2] Changes represent total potential change in the first decade as compared to the historical average (1980-1989)

Alternative L (Oregon Natural Resources Council) - PNV: $1.6 Billion - Opportunity Cost: $1,173 Million as compared to Alternative D.

Alternative L emphasizes the protection of remaining old growth and maintenance of the natural attributes of the Forest. Achievement of these goals would require further reductions in the acres where the primary goal is timber production. The timber harvest level is 27 million cubic feet or 59 million cubic feet less than Alternative D, and is the lowest of all alternatives. All the economic indicators are at their lowest level, reflecting the low timber harvest level. Conversely, Alternative L would retain the greatest amount of old growth at the end of the first decade of all the alternatives with 578.3 M acres or 41.1 M acres more than Alternative D.

Alternative L would maintain all of the current inventory of roadless area in a roadless condition. Approximately 145.9 M acres are allocated to roadless management prescriptions and an additional 169.4 M acres would be recommended for Wilderness designation. The acres that would be maintained in roadless allocations in Alternative L are the most of any alternative. In addition, 184 spotted owl habitat areas, enough to protect the known owl population outside of Wilderness, would be preserved. Deer populations would decrease due to the decrease in forage as a result of lower timber harvest levels. Due to the low level of timber harvest and large amount of land maintained in a natural condition, 0% of the Forest would be in the high or moderate risk category for adverse watershed effects. This is 22% less than the acres similarly rated under Alternative D.

Table B-52 summarizes the tradeoffs associated with Alternative L with respect to the PNV Benchmark and Alternative D.

Table B-52. Comparison of Alternative L with PNV Benchmark and Alternative D

Selected Issues	Units	Alt L	Change From PNV Benchmark	Change From Alt D
PNV	$MMM	1.6	- 2.2	- 1.2
Non-cash Benefit	$MM/Yr	41	+ 2	+ 3
ASQ[1]	MMBF	150	- 510	- 326
ASQ[1]	MMCF	27	- 86	- 59
LTSY	MMCF	34	- 89	- 60
Changes in Jobs[2]	Number	-5499	-8164	-5332
Old Growth Remaining 1st Decade	M Acres	578.3	+ 57.6	+ 41.1

[1] Units are average annual for 1st decade

[2] Changes represent total potential change in the first decade as compared to the historical average (1980-1989)

APPENDIX C

ROADLESS AREAS

PURPOSE

The purpose of this Appendix is to present a detailed and site-specific analysis of the areas of the Willamette National Forest that are in an unroaded and essentially undeveloped condition. It includes a description of the resources, physiographic and biologic features, and the present management situation for each area. In addition, it specifically indicates how each area would be affected by the Alternatives proposed in this FEIS.

BACKGROUND

This evaluation of roadless areas has been conducted in a setting following some important background legislation and activities. These include the Wilderness Act, the second Roadless Area Review and Evaluation (RARE II), the National Forest Management Act, and the Oregon Wilderness Act. These are discussed as follows.

The Wilderness Act

The 1964 Wilderness Act establishes the National Wilderness Preservation System, defines wilderness, and provides for activities which may occur within designated Wilderness areas.

The Act defines Wilderness as an area where the earth and its community of life are untrammeled by humans, where a person is a visitor who does not remain...an area of undeveloped Federal land containing its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

The Act provides that rights of access to non-National Forest lands surrounded by a Wilderness will be granted the landowner.

Subject to valid existing rights, minerals in lands within Wilderness are withdrawn from appropriations under mining laws and disposition of mineral leasing laws. Validated mining claims and minerals leases predating January 1, 1984, may be accessed and operated provided there will be no unnecessary or undue degradation of Wilderness.

Forest Service proposals for Wilderness are recommendations only. Final decisions on Wilderness designation have been reserved by the Congress to itself.

The Roadless Area Review and Evaluation

In January 1979 the Forest Service issued nationally a Final Environmental Statement documenting a review of 62 million acres of roadless and undeveloped areas within the 190 million acre National Forest system. The purpose of this second Roadless Area Review and Evaluation (RARE II) was to determine which areas were suitable for Wilderness and which should be used for other purposes.

The RARE II Environmental Statement was the basis for recommending that Congress designate 15.1 million acres as Wilderness, that about 36 million acres should be managed for multiple use purposes other than Wilderness, and that the remaining 10.8 million acres needed further planning before a decision could be made.

In 1979, the state of California challenged the adequacy of the RARE II Final Environmental Statement as the basis for decisions to manage 47 areas in that state for other than Wilderness (State of California vs. Block). In October 1982 the United States Court of Appeals for the Ninth Circuit affirmed the lower court decision that the RARE II Final Environmental Statement was inadequate.

The National Forest Management Act

In September 1983 the National Forest Management Act Regulation (36 CFR Part 219.17) was revised, directing that unless otherwise provided by law, roadless areas within the National Forest System will be evaluated and considered for recommendation as potential Wilderness during the Forest planning process.

Roadless areas subject to evaluation include those previously inventoried in RARE II, in a unit plan, or in a Forest plan, which remain essentially roadless and undeveloped, and which have not yet been designated as Wilderness or for non-Wilderness uses by law.

The Oregon Wilderness Act

With the passage of the Oregon Wilderness Act of 1984, Congress directed that, when developing this Forest Plan, the Forest Service is not required to review the Wilderness option for the remaining Roadless Area Review and Evaluation (RARE II) areas, areas less than 5,000 acres in size, certain areas evaluated for Wilderness in unit plans, and Further Planning Areas. This law does provide that the areas that are still in an unroaded condition when this Plan is revised will be reviewed with Wilderness as an option. Section 7 of the Oregon Wilderness Act follows.

"The Congress finds that:

1. The Department of Agriculture has completed the second roadless area review and evaluation program (RARE II);

2. The Congress has made its own review and examination of national forest system roadless areas in Oregon and the environmental impacts associated with alternative allocations of such areas.

On the basis of such review, the Congress hereby determines and directs that:

1. Without passing on the question of legal and factual sufficiency of the RARE II final environmental statement (dated January 1979) with respect to National Forest lands in states other than Oregon, such statement shall not be subject to judicial review with respect to national forest system lands in the State of Oregon;

2. With respect to the national forest system lands in the State of Oregon which were reviewed by the Department of Agriculture in the second roadless area review and evaluation (RARE II), and those lands referred to in subsection (d), except those lands remaining in further planning or special management pursuant to section 4 of this Act upon enactment of this Act, that review and evaluation or reference shall be deemed for the purpose of the initial land management plans required for such lands by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976, to be an adequate consideration of the suitability of such lands for inclusion in the National Wilderness Preservation System and the Department of Agriculture shall not be required to review the wilderness option prior to the revision of the plans, but shall review the wilderness options when the plans are revised, which revisions will ordinarily occur on a ten-year cycle, or at least every fifteen years, unless prior to such time the Secretary of Agriculture finds that conditions in a unit have significantly changed;

3. Areas in the State of Oregon reviewed in such final environmental statement or referenced in subsection (d) and not designated as wilderness or for special management pursuant to section 4 of this Act or remaining in further planning upon enactment of this Act shall be managed for multiple use in accordance with land management plans pursuant to section 6 of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976: Provided, that such areas need not be managed for the purpose of protecting their suitability for wilderness designation prior to or during revision of the land management plans;

4. In the event that revised land management plans in the State of Oregon are implemented pursuant to section 6 of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976, and other applicable law, areas not recommended for wilderness designation, need not be managed for the purpose of protecting their suitablility for wilderness designation prior to or during revision of such plans, and areas recommended for wilderness designation shall be managed for the purpose of protecting their suitability for wilderness designation as may be required by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976, and other applicable law; and

5. Unless expressly authorized by Congress, the Department of Agriculture shall not conduct any further statewide roadless area review and evaluation of national forest system lands in the State of Oregon for the purpose of determining their suitability for inclusion in the National Wilderness Preservation System.

As used in this section, and as provided in section 6 of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976, the term "revision" shall not include an "amendment" to a plan.

The provisions of this section shall also apply to:

1. Those National Forest System roadless lands which were evaluated in the Mt. Hood, Siskiyou, Umatilla, Umpqua, Wallowa-Whitman, Willamette, and Winema National Forests in the State of Oregon which were evaluated in the Eagle Creek; Roaring River; Mt. Butler-Dry Creek; Oregon Butte; Cougar Bluff-Williams Creek; Grand Ronde; Wallowa Valley; Willamette; or Chemult unit plans; and

2. National Forest System roadless land in the State of Oregon which are less than 5,000 acres in size."

THE INFORMATION PRESENTED IN THIS APPENDIX

This Appendix presents information about the unroaded areas to disclose the environmental effects of allocating each area to a continued unroaded condition, or to some level of development (of all or a portion of each area).

To do this, this Appendix presents a description of the environment, presents the proposed management allocation for each of the Alternatives, and discloses the environmental consequences of those Alternatives for each area. The descriptions include information for the Wilderness evaluation criteria of capability, availability, and need.

It should be noted that in the Figures that present the effects, habitats for Major Indicator Species may included portions of several habitats scattered throughout the roadless area. These portions are not to be confused as being the total habitat area.

Descriptions of ecosystems are derived from ecoregions identified by Bailey and potential natural vegetation mapped by Kuchler. Delineation of ecosystems provides a method to determine distribution of natural ecosystems within the National Wilderness Preservation System (NWPS). It allows identification of opportunities to provide additional representations of a particular ecosystem within the NWPS. The potential natural vegetation is that vegetation that would occur naturally in a given area if succession were not interrupted by manipulation. Ecoregions are characterized by distinctive flora, fauna, climate, landform, soil, vegetation, and ecological climax.

Maps that show the inventoried roadless areas in Appendix C have two characteristics. First, all roadless areas are outlined with a bold black line. Second, the roadless area being described will have a gray tint covering the area. Nearby roadless areas are also outlined in bold black lines.

For orientation of where the roadless areas are located on a Forest wide basis refer to Figure III-Q-3 in Chapter III of this FEIS.

Bull of the Woods - 6,378 Acres

Description

History Bull of the Woods was studied as the Little North Santiam Area in RARE I, and RARE II. About 6,165 acres were included in the Oregon Wilderness Act of 1984 as the Bull of the Woods Wilderness. This is not to be confused with the inventoried roadless area that is also called Bull of the Woods for our report. This Act resulted in 6,378 acres released for multiple use management in the Willamette National Forest. The area is contiguous to 11,400 acres of Bull of the Woods roadless area on the Mt. Hood National Forest.

Location and Access T. 8 S., R. 4 and 5 E. Bull of the Woods is located within Marion County approximately eight miles north and west of Detroit on the Detroit Ranger District. The area is contiguous to unroaded lands on the northeast in the Mt. Hood National Forest. It is accessed from the east by Trail 3370 and is bordered by Forest Road 2209 on the south. Forest Trails 3369, 3356, and 3352 traverse the area.

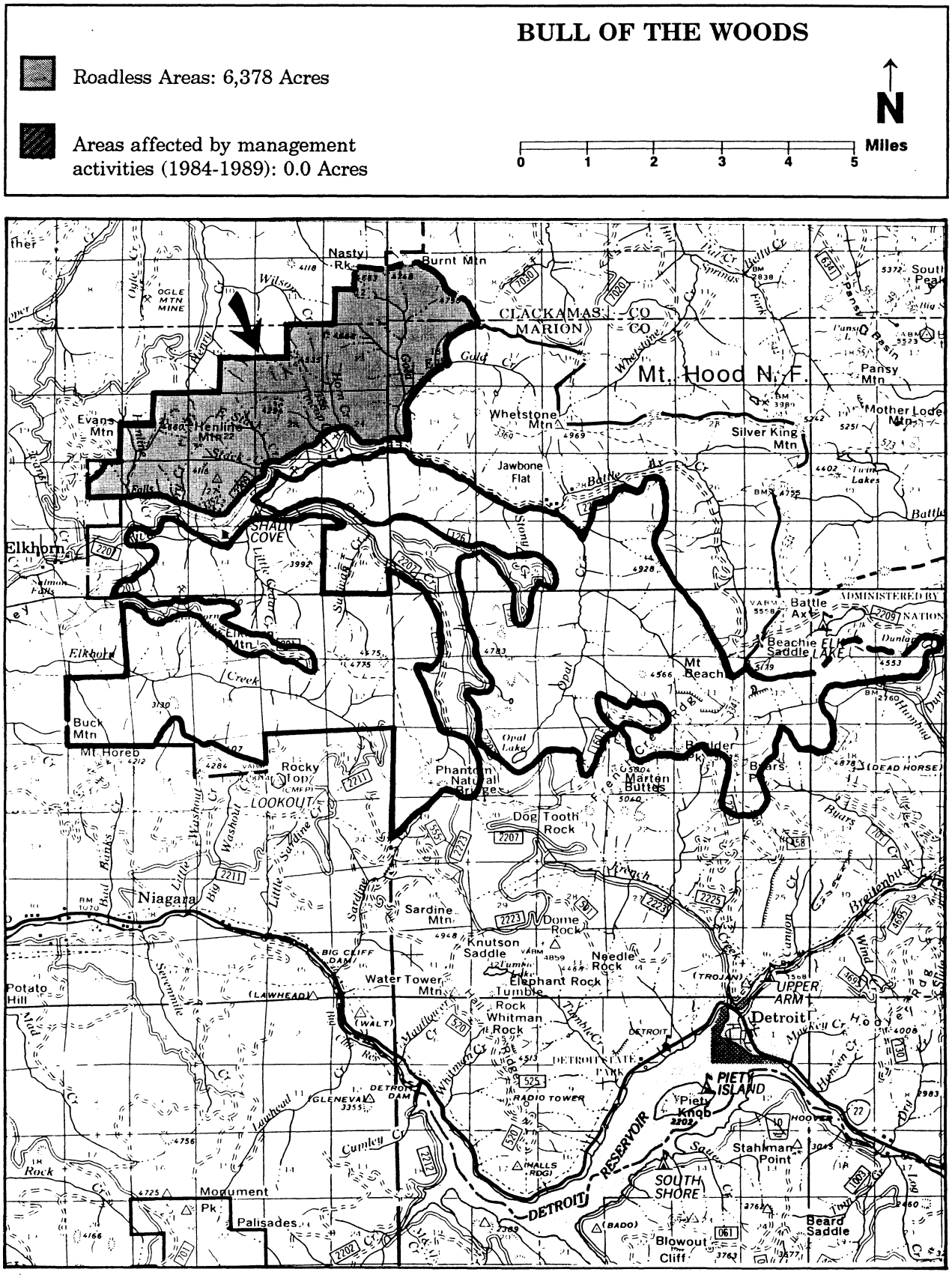
Geography and Topography The area is characterized by very steep, mountainous country, dissected by numerous streams. Elevations range from 1,600 at Henline Creek to 4,795 feet along the boundary ridge with the Mt. Hood National Forest. Lower slopes are typically steep. Upper slopes are commonly steep and rocky with outcrops.

Soil Upper slopes are often associated with a shallow soil mantle (depths of eight to 25 inches) with high erosion hazard. They are generally associated with landtypes 3, 9, 61, and 710. There are about 4,543 acres that have potential for severe surface erosion; and approximately 21 acres of potentially severe surface erosion and unstable soil. The area west of the Gold Creek drainage is generally on land types which cannot be reforested within five years. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Upper slopes are typically forested with Douglas-fir, true fir, and western hemlock. Lower and middle slopes are covered by stands of Douglas-fir and western hemlock.

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976); Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir
(*Abies-Pseudotsuga*) forest (003).

Figure C-1-1


BULL OF THE WOODS
Roadless Areas: 6,378 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
Miles
0 1 2 3 4 5
Mt. Hood N. F.
CLACKAMAS CO
MARION CO
Nasty Rk
Burnt Mtn
Wilson Cr
Gold Cr
Whetstone Mtn
Silver King Mtn
Pansy Mtn
Mother Lode Mtn
Jawbone Flat
Battle Ax Cr
Evans Mtn
Henline Mtn
SHADY COVE
Elkhorn
Elkhorn Creek
Buck Mtn
Mt Horeb
Rocky Top
LOOKOUT
Phantom Natural Bridge
Opal Lake
Mt Beach
Beachie Saddle
LAKE
Battle Ax
ADMINISTERED BY
Marten Buttes
Dog Tooth Rock
Niagara
Sardine Mtn
Dome Rock
Knutson Saddle
Needle Rock
Elephant Rock
Tumble Rock
Whitman Rock
Water Tower Mtn
Potato Hill
BIG CLIFF DAM
DETROIT DAM
GLENEVA
RADIO TOWER
DETROIT STATE PARK
Detroit
UPPER ARM
PIETY ISLAND
Piety Knob
Stahlman Point
SOUTH SHORE
DETROIT RESERVOIR
Monument Pk
Palisades
Blowout Cliff
Beard Saddle

Current Uses Mining and prospecting activities are evident in the Gold Creek and Henline Creek drainage. Approximately 80 acres are in patented mining claims and numerous mining claims are staked in this drainage. Hiking and backpacking along ridgetop trails are other uses. Land allocations from the 1977 Willamette National Forest land Management Plan, are General Forest in the Gold Creek drainage and dispersed unroaded recreation for the remainder.

Appearance This area is characterized by large bands of rock outcrops occurring at all points on the slopes from ridgetop to creek bottom. Hillsides contain highly dissected, steep, "V" shaped drainages. Ridges are generally rocky and knife-edged. Age and size class diversity of the timber stands is extensive as a result of repeated burning in the past. The Gold Creek Drainage has a high density of snags and a heavy understory of rhododendron.

Surroundings The area to the east is classified as Wilderness with the exception of 80 acres of private land (patented mining claims). To the northeast is the Mt. Hood National Forest and the Salem District Bureau of Land Management. About 15 to 25 percent of these lands have been clearcut. The land to the northwest is privately owned and has been almost entirely cutover. To the south is National Forest Land administered by the Detroit Ranger District of the Willamette National Forest. Clearcuts occur along Elkhorn Ridge.

Attractions The primary attraction is Forest Trail 3348 accessing the abandoned lookout site on Henline Mountain which provides scenic views. Other attractions are Forest Trails 3357 and 3356 with their views of forest and wildlife as they ascend the slopes to the north of the Little North Santiam River.

Capability

Manageability and Boundaries All boundaries would be easily managed.

Natural Integrity Bull of the Woods includes roads (0.5 mile mining road near east side of Gold Creek), helispots (four located on ridgetops within the area), trails (6.8 miles of traversing the area), mineral developments (adits), vegetative manipulation, fire history, and air pollution.

Roads and mineral developments are in isolated areas with natural processes interrupted to a low degree. Helispots are present but the natural processes have not been disturbed to any extent. The impacts of trails and vegetative manipulation are present and measurable but of only minor significance, and processes continue to operate largely uninterrupted. Although smoke and air pollution are occasionally present, the effects on natural processes are currently unknown.

Natural Appearance Without the mineral development separated, the roadless area appears to be natural to most visitors but there are some visual impacts apparent. With the mineral development separated, most visitors would find the roadless area apparently natural.

Opportunity for Solitude Opportunities for solitude are high with a diversity of highly dissected topography that easily screens people from one another within short distances. Most of the area has dense vegetation which also screens people from one another; however, the rugged terrain tends to concentrate people on existing trails. Offsite intrusions from mining activities and adjacent timber harvesting are perceptible, but most are relatively distant and generally not permanent.

Opportunities for Primitive Recreation Bull of the Woods offers high potential for primitive recreation. The principal contributors to diversity are ridgetops and creek bottoms. Challenges and hazards are similar or greater to what is normally expected in typical western Oregon Douglas-fir

timber stands. The only facilities available are low standard trails; and some undeveloped campsites that receive recurring use.

Special Features Several cultural resource sites exist in the roadless area. The ridge along the northern boundary was apparently used as a travel route to the higher elevation berry fields and hunting grounds by Native Americans. Several creeks have historic mining activity. For more information, see *Little North Santiam Mining District Cultural Resource Inventory Report* (Cox 1985).

No federally listed threatened or endangered species are known to be present.

Availability

Resource Potentials

Recreation Resource Currently the area provides primarily day-use opportunities. Existing trails have point destinations and no water available for much of the year. Other than on established trails, the area receives little use due to the rugged terrain. With construction of connecting trails along the ridge system, camping would be feasible but water would generally not be available. Capacity estimates indicate that this area could provide 3,654 Recreation Visitor Days (RVDs) of Semiprimitive Dispersed Nonmotorized recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. No potential developed recreation sites have been identified.

Wildlife Resource Bull of the Woods roadless area is characterized by rugged terrain and considerable habitat and species diversity. Second growth and old-growth conifer forests contain numerous unique habitat features such as rock outcrops, alder and vine maple stands, and small ponds. Riparian areas along stream courses offer prime habitat for a multitude of wildlife. The area receives moderate use by black bear, coyote, bobcat and small fur-bearing animals as well as an abundance of songbirds.

The area is classified almost entirely as summer range for deer and elk. Deer densities are low because of lack of forage. Cutover land on adjacent ownerships provides most of the available forage. Elk use is minimal due to the rugged terrain.

A management regime that increased diversity through timber harvest would probably increase big game use if consideration was given to good unit design and location.

Developing late successional stands would increase the quality of old growth for spotted owls.

Timber Resource The area west of the Gold Creek drainage as well as the upper slopes of the Gold Creek drainage are predominantly unsuited for timber production due to the low regeneration potential. The stands have high defect and are characterized by a high content of snags. The roadless area includes about 3,178 acres of land that is tentatively suitable for growing timber under managed conditions. Site productivity ranges from Class IV to Class V. Stands of mature Douglas-fir and western hemlock occupy the area representing about 141 million board feet. If stands are converted to a managed condition, biological potential yield will be 429,000 cubic feet per year at culmination of mean annual increment. The remaining 3,264 acres are unsuitable.

Land Use Authorizations Portions of a stipulated mining claim are located on Gold Creek near Forest Road 2209. As of October 1986, Shiny Rock Mining Corporation has filed for a patent on this claim and the application is pending. Publishers Paper Company have a permit for use of the existing road on the east side of Gold Creek.

Management Considerations

Fire Fuel loading averages 50 tons per acre; however, any specific area may vary significantly from this average.

Insects and Disease A high incidence of western hemlock mistletoe occurs.

Private Land The surface rights for the patented mining claims in the Gold Creek drainage are controlled on 64 acres by Publishers Paper Company. The subsurface rights are controlled by Shiny Rock Mining Corporation. Portions of a stipulated mining claim are located within the roadless area on Gold Creek near Road 2209.

Need

Nearby Wilderness and Its Use The Bull of the Woods Wilderness (34,900 acres) is adjacent to the eastern boundary of the roadless area. The portion of the Wilderness adjacent to the roadless area has received very little use in the past; however with its recent (1984) designation as Wilderness, use is anticipated to increase. As of 1985, this Wilderness received 14,700 RVDs of use primarily from hiking, camping, and fishing. For more information about Bull of the Woods Wilderness, refer to Chapter III.

Five miles to the north is Table Rock Wilderness (5,500 acres) on the Salem District of the USDI Bureau of Land Management. Its primary use is hiking.

Distance from Population Centers The area is approximately 40 miles by road to the east of Salem, and 70 miles from Portland.

Interest by Proponents The Bull of the Woods roadless area generated a high amount of interest with 68 percent of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Bull of the Woods roadless area. In Alternatives NC, K, and A, about 35 percent of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with Alternative NC, A, and K would alter the suitability of this area for future Wilderness consideration. Alternatives J, W, D, and L maintain the option of future Wilderness consideration for this area. Figure C-1-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Bull of the Woods roadless area an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, and A. Amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives C, D, F, and J, and J-Departure. The amounts of goods and services to be provided from the area for each Alternative are illustrated in Figure C-1-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

timber stands. The only facilities available are low standard trails; and some undeveloped campsites that receive recurring use.

Special Features Several cultural resource sites exist in the roadless area. The ridge along the northern boundary was apparently used as a travel route to the higher elevation berry fields and hunting grounds by Native Americans. Several creeks have historic mining activity. For more information, see *Little North Santiam Mining District Cultural Resource Inventory Report* (Cox 1985).

No federally listed threatened or endangered species are known to be present.

Availability

Resource Potentials

Recreation Resource Currently the area provides primarily day-use opportunities. Existing trails have point destinations and no water available for much of the year. Other than on established trails, the area receives little use due to the rugged terrain. With construction of connecting trails along the ridge system, camping would be feasible but water would generally not be available. Capacity estimates indicate that this area could provide 3,654 Recreation Visitor Days (RVDs) of Semiprimitive Dispersed Nonmotorized recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. No potential developed recreation sites have been identified.

Wildlife Resource Bull of the Woods roadless area is characterized by rugged terrain and considerable habitat and species diversity. Second growth and old-growth conifer forests contain numerous unique habitat features such as rock outcrops, alder and vine maple stands, and small ponds. Riparian areas along stream courses offer prime habitat for a multitude of wildlife. The area receives moderate use by black bear, coyote, bobcat and small fur-bearing animals as well as an abundance of songbirds.

The area is classified almost entirely as summer range for deer and elk. Deer densities are low because of lack of forage. Cutover land on adjacent ownerships provides most of the available forage. Elk use is minimal due to the rugged terrain.

A management regime that increased diversity through timber harvest would probably increase big game use if consideration was given to good unit design and location.

Developing late successional stands would increase the quality of old growth for spotted owls.

Timber Resource The area west of the Gold Creek drainage as well as the upper slopes of the Gold Creek drainage are predominantly unsuited for timber production due to the low regeneration potential. The stands have high defect and are characterized by a high content of snags. The roadless area includes about 3,178 acres of land that is tentatively suitable for growing timber under managed conditions. Site productivity ranges from Class IV to Class V. Stands of mature Douglas-fir and western hemlock occupy the area representing about 141 million board feet. If stands are converted to a managed condition, biological potential yield will be 429,000 cubic feet per year at culmination of mean annual increment. The remaining 3,264 acres are unsuitable.

Land Use Authorizations Portions of a stipulated mining claim are located on Gold Creek near Forest Road 2209. As of October 1986, Shiny Rock Mining Corporation has filed for a patent on this claim and the application is pending. Publishers Paper Company have a permit for use of the existing road on the east side of Gold Creek.

Management Considerations

Fire Fuel loading averages 50 tons per acre; however, any specific area may vary significantly from this average.

Insects and Disease A high incidence of western hemlock mistletoe occurs.

Private Land The surface rights for the patented mining claims in the Gold Creek drainage are controlled on 64 acres by Publishers Paper Company. The subsurface rights are controlled by Shiny Rock Mining Corporation. Portions of a stipulated mining claim are located within the roadless area on Gold Creek near Road 2209.

Need

Nearby Wilderness and Its Use The Bull of the Woods Wilderness (34,900 acres) is adjacent to the eastern boundary of the roadless area. The portion of the Wilderness adjacent to the roadless area has received very little use in the past; however with its recent (1984) designation as Wilderness, use is anticipated to increase. As of 1985, this Wilderness received 14,700 RVDs of use primarily from hiking, camping, and fishing. For more information about Bull of the Woods Wilderness, refer to Chapter III.

Five miles to the north is Table Rock Wilderness (5,500 acres) on the Salem District of the USDI Bureau of Land Management. Its primary use is hiking.

Distance from Population Centers The area is approximately 40 miles by road to the east of Salem, and 70 miles from Portland.

Interest by Proponents The Bull of the Woods roadless area generated a high amount of interest with 68 percent of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Bull of the Woods roadless area. In Alternatives NC, K, and A, about 35 percent of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with Alternative NC, A, and K would alter the suitability of this area for future Wilderness consideration. Alternatives J, W, D, and L maintain the option of future Wilderness consideration for this area. Figure C-1-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Bull of the Woods roadless area an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, and A. Amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives C, D, F, and J, and J-Departure. The amounts of goods and services to be provided from the area for each Alternative are illustrated in Figure C-1-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-1-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	21
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	107
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	149
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	2,986
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	704	661	--	--	--	21
Management Area **9b**	--	--	--	--	--	--	171
Management Area **9c**	--	--	--	--	--	--	171
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	21	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	4,181	4,223	4,181	6,100	6,036	6,015	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	85	--	--	--	--	--
Management Area **11c**	64	--	43	--	--	--	--
Management Area **11d**	--	--	--	85	64	--	--
Management Area **11e**	--	--	--	--	--	--	64
Management Area **11f**	192	--	192	--	64	171	2,560
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	1,941	1,280	1,216	171	171	171	--
15 Riparian [2]							
Management Area **15**	*	*85	*85	*21	21	21	128

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-1-3. Bull of the Woods Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	21
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	284	486	284	637	561	637	--
	Acres	4,181	4,223	4,181	6,100	6,036	6,015	--
Semiprimitive Motorized	RVDs	--	--	--	--	65	--	--
	Acres	--	--	--	--	21	--	--
Roaded Natural	RVDs	988	988	1,976	494	988	494	8,299
	Acres	256	789	981	107	149	192	6,356
Roaded Modified	RVDs	1,860	1,101	1,481	721	721	721	--
	Acres	1,941	1,365	1,216	171	171	171	--
Trails								
Existing Trails								
Full Protection Level	Miles	4.0	4.0	4.0	4.0	4.0	4.0	3.0
Moderate Protection Level	Miles	--	--	0.0	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Moderate Protection Level	Miles	--	--	--	--	--	--	2.0
Low Protection Level	Miles	2.0	2.0	2.0	1.0	1.0	1.0	--
Visual Quality Objectives								
Preservation	Acres	4,181	4,927	4,842	6,100	6,036	6,015	3,477
Retention	Acres	192	--	192	--	85	171	2,624
Partial Retention	Acres	64	85	128	107	85	21	277
Modification	Acres	--	85	--	--	--	--	--
Maximum Modification	Acres	1,941	1,280	1,216	171	171	171	--
1st Decade								
Road Construction	Miles	--	1.2	1.5	0.7	0.2	0.5	0.9
Area Harvested	Acres	--	242	238	84	36	74	46
Programmed Timber Harvest	MBF	--	1,915	1,322	256	277	277	1,003
Area Remaining Undeveloped	%	--	88	88	96	98	96	98
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	1,728	1,067	1,066	149	150	149	--
75-94% of Full Yield	Acres	--	21	21	64	64	--	--
50-74% of Full Yield	Acres	192	107	235	43	64	128	128
30-49% of Full Yield	Acres	--	--	--	--	--	--	875

Opal Creek - 10,687 Acres

Description

History A portion of the Opal Creek roadless Area was studied under RARE I as Little North Santiam. It was also studied in RARE II and combined in the description with Bull of the Woods. Portions of Opal Creek were also considered for inclusion in the Oregon Wilderness Act of 1984. Out of a total of 12,670 acres, 1,301 acres were included in the Bull of the Woods Wilderness and 11,284 acres were released for multiple use management. Since the release of these lands in 1984, approximately 597 acres have been affected by development activities.

Location and Access Tps. 8 and 9 S., Rs. 5 and 6 E. Opal Creek is located within Marion County approximately eight miles to the north and west of Detroit. The area is contiguous on the northeast corner to the Mt. Hood National Forest. Forest Road 2209 lies north of the area, with Road 2207 to the west, and Roads 2225 and 160 on the south. Forest Trails 3341 and 3358 provide access to the interior of the area.

Geography and Topography The area is characterized by very steep mountainous country dissected by numerous streams. Elevations range from 2,200 feet near the mouth of Opal Creek to 5,133 feet at Byars Peak. Slopes are typically steep with rocky outcrops on the upper slopes.

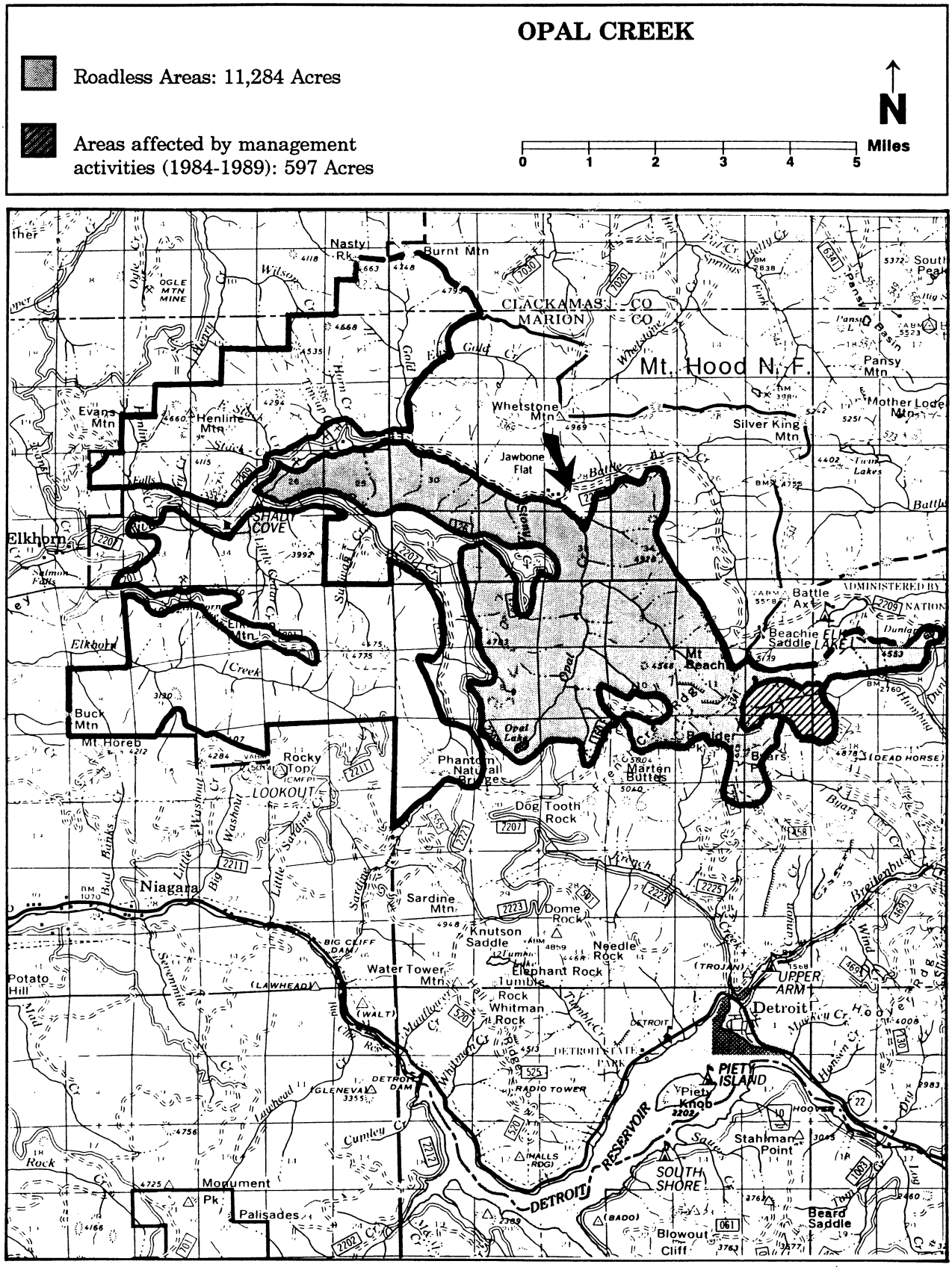
Soils A shallow soil mantle (depths eight to 25 inches) with high erosion hazard is associated with the upper slopes. There are about 4,970 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The area is typically forested with Douglas-fir, true fir, and western hemlock. Lower slopes are covered by dense stands of Douglas-fir and western hemlock while upper slopes are covered with true firs and some maintain hemlock.

Ecosystem Type There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses Hiking, fishing, and backpacking are primary uses; however, use is light. General Forest is the predominant allocation with Scenic Influence II along Opal Creek as allocated in the 1977 Forest Land Management Plan. Since this area was inventoried in 1984, management activities are estimated to have affected 640 acres of this area.

Figure C-2-1


OPAL CREEK
Roadless Areas: 11,284 Acres
Areas affected by management activities (1984-1989): 597 Acres
N
0 1 2 3 4 5 Miles
CLACKAMAS CO
MARION CO
Mt. Hood N.F.
Nasty Rk
Burnt Mtn
Whetstone Mtn
Jawbone Flat
Pansy Mtn
Mother Lode Mtn
Silver King Mtn
Evans Mtn
Henline Mtn
Elkhorn
SHADY COVE
Elk Mtn
Buck Mtn
Mt Horeb
Rocky Top
LOOKOUT
Phantom Natural Bridge
Opal Lake
Mt Beach
Marten Butte
Dog Tooth Rock
Niagara
Sardine Mtn
Knutson Saddle
Dome Rock
Needle Rock
Elephant Rock
Tumble Rock
Whitman Rock
Water Tower Mtn
Potato Hill
(LAWHEAD)
(WALT)
BIG CLIFF DAM
DETROIT DAM
(GLENEVAL)
RADIO TOWER
Detroit
UPPER ARM
(TROJAN)
PIETY ISLAND
Piety Knob
Stahlman Point
SOUTH SHORE
DETROIT RESERVOIR
Monument Pk
Palisades
Blowout Cliff
Beard Saddle
Battle Ax
Beachie Saddle
LAKE
(DEAD HORSE)
ADMINISTERED BY

Appearance This area is characterized by a continuous forested canopy with rock outcrops occurring on the slopes. Hillsides contain highly dissected, steep "V" shaped drainages. Ridges are generally rocky and knife-edged which screen the views of adjacent timber management activities from roadless area users.

Surroundings Land adjoining the boundaries to the north is Wilderness, to the east, south, and west is General Forest as allocated by the 1977 Land Management Plan. There is some private land in the Cedar Creek drainage. Timber harvesting is apparent on several boundaries.

Attractions Opal Lake, Opal Pool, Opal Falls, existing trails, and the brushed road survey line to Opal Creek are the primary attractions in the roadless area.

Capability

Manageability and Boundaries Existing timber harvest units would cause problems with the manageability and affect the natural character of the area.

Natural Integrity Management activities present are helispots, seven miles of maintained trails, occasional smoke intrusions, and vegetative manipulation in the form of timber sales. Natural processes are disturbed to some extent. Natural processes continue to operate uninterrupted where the other activities occur. Although the impacts of air pollution are sometimes present, the effects on natural process are either nonexistent or so minimal as to be insignificant in any ecological sense.

Natural Appearance The roadless area appears to be natural to most visitors with only limited clues of unnaturalness.

Opportunity for Solitude Opportunities for solitude are moderate. Diversity of topography offers screening potential in at least half the area, but may be limited or lacking in the remainder. Most of the roadless area has dense vegetation which screens people from one another, even within a quarter mile. Offsite intrusions are perceptible, but most are relatively distant and generally not permanent.

Opportunities for Primitive Recreation Opportunities for primitive recreation are moderate with a limited range of fish and wildlife species, similar terrain throughout, and no particular hazards or challenges.

Special Features The Opal Creek area contains one vegetative feature of infrequent occurrence in this area: a variety of mountain ash along Battle Ax Creek, and some Douglas maple. As many as 108 species of plants have been identified along French Ridge including Gorman's Aster and Cascade daisy. The area also contains cultural resource features. No federally listed endangered or threatened species are known to be present.

Availability

Resources Potentials

Recreation Resource Currently the area provides day-use opportunities, although the trail on French Creek Ridge is lightly used by backpackers. Opal Lake receives a moderate amount of use for fishing and camping. Other than on established trails and the brushed survey lines, the area receives little use. A long range proposal for a trail along Opal Creek and into the heart of the roadless area exists. Capacity estimates indicate that this area could provide 6,879 Recreation Visitor Days (RVDs) of Semiprimitive Dispersed Nonmotorized recreation use. Potential trails totaling 14.4 miles have been

identified and could provide for access and disperse visitors in the area. A potential 40 acre campground has been identified at Opal Lake along the southern edge. This potential site could accommodate 100 Persons-At-One-Time (PAOT) and provide 12,000 RVDs of developed site use annually.

Wildlife Resource The area receives very little big-game use. Black-tailed deer are present in small numbers, generally near plantations along the western, southern, and eastern boundaries where forage is plentiful. Other species common to the western slopes of the Cascade Range are present.

Opal Creek roadless area supports an old-growth Douglas-fir, western hemlock, Pacific silver fir ecosystem which provides habitat for species adapted to these stand conditions. The terrain is rugged and habitat diversity is minimal throughout most of the roadless area. Exceptions are evident in the diverse riparian habitat along stream bottoms and in the rock outcrops, hardwood stands, meadows and small lakes east of Mt. Beachie. Dead and defective tree habitat is abundant throughout the area.

A pair of spotted owls has been verified and two other single owl responses have been recorded within the roadless area boundaries. Deer use is minimal due to lack of forage and elk use is generally light to non-existent because of topographic conditions. Evidence of black bear is plentiful. Chickaree, chipmunk and snowshoe hare are also common. Warblers, sparrows, thrushes and other songbirds as well as great horned owls are known to use the area. Adding diversity in successional stages through timber harvest would increase use by big-game if harvest unit size, shape and arrangement is considered. Trout populations (both rainbow and brook) can be found in the larger streams and lakes.

Timber Resource The area has stands of large, old-growth Douglas-fir, western hemlock, true firs, and mountain hemlock representing about 314 million board feet. The largest timber is in the creek bottoms. Most of the stands have high defect which is a characteristic of the old-growth ecosystem. The roadless area includes about 6,634 acres of land suitable for growing timber under managed conditions. If stands are converted to a managed condition, biological potential yield will be 966,000 cubic feet per year at culmination of the mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resources Several sites exist, French Creek Ridge was apparently used as a travel route to the higher elevation berry fields and hunting grounds by Native Americans and the lower reaches of Opal Creek have historic mining resources. For more information, see *Little North Santiam Mining District Cultural Resource Inventory Report* (Cox 1985).

Land Use Authorizations Portions of four stipulated mining claims are located along the northern boundary. Shiny Rock Mining Corporation has filed for patent on these claims; the application is pending as of October 1986.

Management Considerations

Fire Fuel loading averages 50 to 60 tons per acre; however, any specific area may vary significantly from this average. Several human caused and one lightning caused fires have occurred between 1975 to 1985.

Private Land Three patented mining claims are located at the north end of Stony Ridge. The subsurface and surface rights are controlled by Shiny Rock Mining Corporation. A road and log stringer bridge are present across the Little North Santiam River that access the base of this claim group.

Need

Nearby Wilderness and Its Use The Bull of the Woods Wilderness (34,900 acres) lies adjacent to the Opal Creek roadless area on the northeastern boundary. This Wilderness was created under the Oregon Wilderness Act of 1984. The land in the Wilderness adjacent to the roadless area has received very little use in the past; however with its recent designation as Wilderness, the use is anticipated to increase. Refer to Chapter III for more information about Bull of the Woods Wilderness. To the northwest 10 miles, is Table Rock Wilderness.

Distance from Population Centers The area lies approximately 47 miles by road east of Salem, Oregon.

Interest by Proponents The Opal Creek roadless area generated a moderate amount of interest with 61 percent of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Opal Creek roadless area. In Alternatives NC, K, A, J, and W 88 to 99 percent of this area will be affected by road construction and timber harvest. In addition Alternatives D and L will affect about 26 percent and 19 percent respectively. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Bull of the Woods Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternatives D and L maintain the option of future Wilderness consideration for most of this area. Figure C-2-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Opal Creek roadless area an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in 74 percent of D and 81 percent of L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-2-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-2-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	7,039
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	341	--	896
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	341
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	256
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	427	555	405	85	277	--
Management Area **9c**	--	341	341	341	341	277	--
Management Area **9d**	--	--	--	--	448	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	2,794	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	192	--	192	--	--	3,797	--
Management Area **10f**	--	235	--	299	--	64	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	2,538	1,024	192	--
Management Area **11b**	--	1,045	--	--	--	213	--
Management Area **11c**	1,706		1,557	--	277		384
Management Area **11d**	832	--	533	1,258	--	661	--
Management Area **11e**	--	--	--	--	--	--	363
Management Area **11f**	1,173	--	1,109	--	1,301	--	1,216
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	85	85	85	85	85	85	85
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	6,698	8,127	6,079	5,333	6,356	1,642	--
15 Riparian [2]							
Management Area **15**	*	*426	*235	*426	426	320	107

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-2-3. Opal Creek Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	7,039
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	29	--	29	--	--	699	--
	Acres	192	--	192	--	--	3,797	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	1,,090	5,582	15,089	11,385	11,903	19,537	9,952
	Acres	3,711	1,429	4,330	2,730	3,221	4,757	3,562
Roaded Modified	RVDs	8,334	11,466	d7,537	9,094	8,866	3,113	95
	Acres	6,783	9,257	6,614	7,956	7,466	2,133	85
Trails								
Existing Trails								
Full Protection Level	Miles	7.0	8.0	7.0	8.0	3.0	8.0	7.0
Moderate Protection Level	Miles	0.0	--	0.0	--	3.0	--	0.0
Low Protection Level	Miles	--	--	--	--	2.0	--	--
Potential Trails								
Full Protection Level	Miles	6.0	7.0	7.0	7.0	3.0	12.0	14.0
Moderate Protection Level	Miles	8.0	4.0	6.0	6.0	12.0	2.0	1.0
Low Protection Level	Miles	0.0	3.0	0.0	0.0	--	0.0	--
Visual Quality Objectives								
Preservation	Acres	192	768	1,088	747	768	4,351	8,191
Retention	Acres	1,173	235	1,109	299	1,749	427	1,578
Partial Retention	Acres	2,538	427	2,325	1,685	704	3,775	832
Modification	Acres	85	1,130	85	--	1,109	491	85
Maximum Modification	Acres	6,698	8,127	6,079	5,333	6,356	1,642	--
1st Decade								
Road Construction	Miles	--	6.2	10.3	12.2	6.2	8.8	1.1
Area Harvested	Acres	--	1,143	1,071	2,269	1,018	1,242	60
Programmed Timber Harvest	MBF	--	9,086	7,928	20,098	0,497	17,842	409
Area Remaining Undeveloped	%	--	67	68	35	71	64	98
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	4,991	4,906	4,458	4,586	3,494	2,815	85
75-94% of Full Yield	Acres	469	107	341	427	128	213	--
50-74% of Full Yield	Acres	1,024	811	1,003	811	1,003	320	512
30-49% of Full Yield	Acres	--	--	--	--	--	--	683

Elkhorn - 8,958 Acres

Description

History The Elkhorn roadless area was studied in RARE I and was later considered for Wilderness by the United States Congress. They released the area for multiple use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 363 acres have been effected by development activities.

Location and Access T. 9 S., Rs. 4 and 5 E. The Elkhorn Area is located within Marion County in the Detroit Ranger District approximately eight miles northeast of Detroit. It is bounded by Forest Road 2207 on the north, Forest 225 on the south, and touched by Forest Road 201 on the west. Forest Trail 3347 along Elkhorn Ridge provides access to the interior.

Geography The roadless area lies between the Little North Santiam River and the North Santiam River on the west side of the Detroit Ranger District.

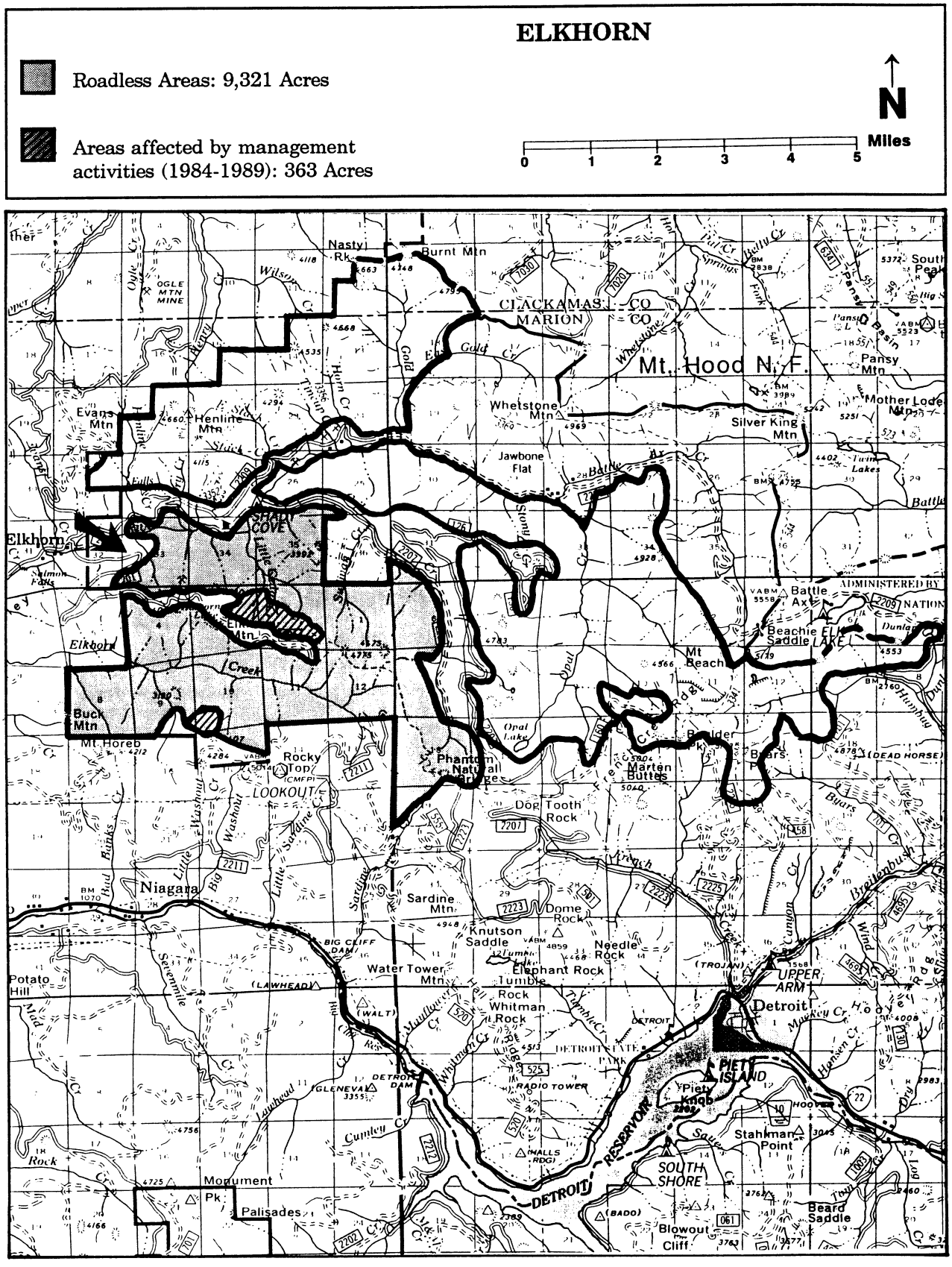
Topography Elevations range from 1,800 feet at the Little North Santiam River to 4,775 feet near the eastern boundary. The slopes are steep to very steep and are highly dissected.

Soil Soil depth on the steep slopes is from 25 to 80 inches, with high erosion hazard. Approximately 40 percent of these soil units are classified as low to medium timber site quality and moderate to easy regeneration potential. The remaining 60 percent are rock and soils with low site class and difficult to regenerate. There are about 5,311 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Most of the timber stands are old-growth and mature stands of Douglas-fir, western hemlock, and western red cedar.

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976); Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-3-1


ELKHORN
Roadless Areas: 9,321 Acres
Areas affected by management activities (1984-1989): 363 Acres
N
Miles
0
1
2
3
4
5
Elkhorn
Buck Mtn
Mt. Horeb
Elkhorn Mtn
Evans Mtn
Henline Mtn
Nasty Rk
Burnt Mtn
CLACKAMAS CO
MARION CO
Mt. Hood N.F.
Whetstone Mtn
Jawbone Flat
Silver King Mtn
Pansy Mtn
Mother Lode Mtn
Battle Ax
Beachie Saddle
Mt Beach
Rocky Top
LOOKOUT
Phantom Natural Bridge
Marten Buttes
Dog Tooth Rock
Niagara
Sardine Mtn
Dome Rock
Knutson Saddle
Needle Rock
Elephant Rock
Water Tower Mtn
Tumble Rock
Whitman Rock
Potato Hill
Detroit
UPPER ARM
PIETY ISLAND
Piety Knob
Stahlman Point
SOUTH SHORE
DETROIT RESERVOIR
Monument Pk
Palisades
Blowout Cliff
Beard Saddle
BIG CLIFF DAM
DETROIT DAM
GLENEVA
RADIO TOWER
DETROIT STATE PARK
ADMINISTERED BY NATION
(DEAD HORSE)
(TROJAN)
(LAWHEAD)
(WALT)
(HALLS RDG)
(BADO)

Current Uses The 1977 Land Management Plan (FLMP) allocated narrow corridor of Scenic Influence I which occurs along the Little North Santiam River and Scenic Influence II which occurs along Forest Trail 3347. The majority of the area is in General Forest with little recreation use; Phantom Bridge attracts a few hikers and there is some hunting and fishing in the area. As of 1985 Environmental Assessments have been completed on four proposed timber sales (Elkhorn Creek, South Sullivan, Top, and Sullivan West). Four more sales (Horeb, West Cedar, Crown, and Upper Elk) are in the planning process. Since this area was inventoried in 1984 management activities are estimated to have affected 480 acres of this area.

Appearance This area is characterized by a continuous forested canopy with rock outcrops occurring on the slopes. Hillsides contain highly dissected, steep, "V"-shaped drainages. Some age and size class diversity of the timber stands exists as a result of past fire history.

Surroundings Lands adjacent on the south and west boundaries are Bureau of Land Management, State of Oregon, and private timber lands. The area to the north is Undeveloped Roadless Recreation and Scenic Influence II (FLMP). To the east is mostly General Forest with corridors of Scenic Influence II going through it.

Attractions Phantom Bridge, a natural rock arch, is the most outstanding attraction.

Capability

Manageability and Boundaries The proposed timber sale harvest units pose a problem and makes this area relatively hard to manage as wilderness and maintain its primitive character. Harvest units would be excluded. If this were done, most boundaries would not follow terrain that forms a barrier, but follow the edge of nonconforming uses. Sights and sounds of civilization would be easily detected.

Natural Integrity Impacts are limited to several rehabilitated drill sites, Elkhorn Ridge Trail, and helispots. These impacts are present and measurable but minor in significance. Natural processes continue to operate uninterrupted.

Natural Appearance Most visitors find the roadless area apparently natural. Evidence of unnaturalness is either absent or apparent only to the most knowledgeable.

Opportunity for Solitude Offsite intrusions from surrounding logging activities and recreational use are perceptible, but relatively distant and generally not permanent. Some offsite intrusions are close-by, but generally not permanent.

Opportunity for Primitive Recreation Opportunities for primitive recreation are good with few outstanding peaks or vistas, and one developed trail. Travel by traversing the steep slopes or creek bottoms is a challenge.

Special Features Phantom Natural Bridge is an outstanding geological feature. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Recreation Resource Currently the area provides primarily day use opportunities, although the trail on Elkhorn Ridge is lightly used by backpackers. Phantom Bridge is the primary attraction. Elkhorn

Creek receives little fishing activity. Capacity estimates indicate that this area could provide 5,640 Recreation Visitor Days (RVDs) of Semiprimitive Dispersed Nonmotorized recreation use. Potential trails totaling 2.2 miles have been identified and could provide access and disperse visitors in the area. No potential developed recreation sites have been identified.

Wildlife Resource Elkhorn roadless area includes both second growth and old-growth habitat in very rugged terrain. Dead and defective tree habitat is abundant. Proper harvest unit design would enhance diversity and therefore big-game populations (mostly deer). Black-tailed deer are present in small numbers near plantations along the boundaries where forage is plentiful. Deer use is light because of lack of forage, and elk use is minimal due to steep topography. Development of late successional stands would increase quality of old growth stands for species dependent on old-growth habitat. Bear, coyote, bobcat, small fur-bearers and songbirds are common. Salmonids are present along the entire length of Elkhorn Creek and anadromous fish can be found in the Little North Santiam River.

Timber Resource The area has stands of large, old-growth Douglas-fir, western hemlock, western redcedar, and true firs representing about 200 million board feet. The largest timber is in the creek bottoms. Most of the stands have high defect which is a characteristic of the old-growth habitat. The roadless area includes about 5,098 acres of land suitable for growing timber under managed conditions. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 738,000 cubic feet per year at culmination of mean annual increment.

Mineral and Energy Resource One quartz-diorite body occurs at the Crown Mine *(Oregon Metal Mines Handbook* 1951).

Cultural Resources Several cultural resource sites exist. Elkhorn Ridge was apparently used as a travel route to the higher elevation berry fields and hunting grounds by Native Americans. Remnants of historical mining activity are located at the Crown Mine. For more information, see *Little North Santiam Mining District Cultural Resource Inventory Report* (Cox 1985).

Management Considerations

Fire Fuel loading averages 50 to 60 tons per acre, however, any specific area may vary significantly from this average. Several human caused fires have occurred between 1975 and 1985.

Need

Nearby Wilderness and Its Use The Bull of the Woods Wilderness (34,900 acres) is within 3 miles with dispersed recreation opportunities in the areas of Opal Creek and Bull of the Woods roadless areas. About 7 miles to the north is Table Rock Wilderness (5,500 acres).

Distance from Population Centers The area lies approximately 40 miles by road east of Salem, Oregon.

Interest by Proponents The Elkhorn roadless area generated a moderate amount of interest with 42 percent of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Elkhorn roadless area. In Alternatives NC, K, A, J, and W, 84 percent of this area will be affected by road

construction and timber harvest. Alternative L will develop 60 percent of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in this portion of the area. Implementation of proposed management activities associated with the Alternatives, except Alternatives D and L, would alter the suitability of this area for future Wilderness consideration. Alternatives D and L maintain the option of future Wilderness consideration for most of this area. Figure C-3-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Elkhorn roadless area an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives D, and 40 percent of L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-3-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-3-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	128	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	192
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	2,709
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	1,365	1,365	1,365	1,365	--	405
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	43
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	8,873	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	2,048	1,898	--	--
Management Area **11b**	--	235	--	43	85	64	--
Management Area **11c**	--	--	--	--	--	--	405
Management Area **11d**	320	--	277	661	256	--	--
Management Area **11e**	--	--	--	--	--	--	64
Management Area **11f**	171	--	171	--	384	--	4,842
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	8,447	7,039	6,826	4,522	4,522	--	--
15 Riparian [2]							
Management Area **15**	*	*299	*299	*278	299	278	278

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-3-3. Elkhorn Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	1,940	--
	Acres	--	--	--	--	--	8,873	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	45
	Acres	--	--	--	--	--	--	43
Roaded Natural	RVDs	1,087	6,521	7,360	9,188	9,337	247	19,238
	Acres	512	1,685	2,133	2,346	2,453	21	8,916
Roaded Modified	RVDs	7,289	5,201	4,860	4,139	4,100	95	--
	Acres	8,447	7,274	6,826	6,612	6,506	64	--
Trails								
Existing Trails								
Full Protection Level	Miles	4.0	4.0	4.0	4.0	1.0	7.0	5.0
Moderate Protection Level	Miles	3.0	2.0	3.0	3.0	6.0	--	3.0
Low Protection Level	Miles	0.0	1.0	0.0	0.0	--	0.0	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	1,365	1,365	1,365	1,493	8,873	3,114
Retention	Acres	171	--	171	--	384	--	4,949
Partial Retention	Acres	341	320	597	981	576	21	896
Modification	Acres	--	235	--	2,090	1,984	64	--
Maximum Modification	Acres	8,447	7,039	6,826	4,522	4,522	--	--
1st Decade								
Road Construction	Miles	--	4.2	4.2	10.2	4.3	0.2	2.6
Area Harvested	Acres	--	745	715	1,474	683	24	138
Programmed Timber Harvest	MBF	--	5,939	5,267	13,066	6,344	347	955
Area Remaining Undeveloped	%	--	74	75	49	76	99	95
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	4,693	3,477	3,455	3,435	3,327	64	128
75-94% of Full Yield	Acres	43	128	149	171	85	--	--
50-74% of Full Yield	Acres	341	405	405	405	363	--	235
30-49% of Full Yield	Acres	--	--	--	--	--	--	2,645

Mt. Jefferson North - 6,036 Acres

Description

History The Mt. Jefferson North roadless area was studied in RARE I, and RARE II. The original acreage was about 16,871 acres. The Oregon Wilderness Act of 1984 designated 7,187 acres as Wilderness. This left 9,684 acres to be released for multiple use management. Since the release of these lands in 1984, approximately 3,648 acres have been affected by development activities.

Location and Access Tps. 9, 10, and 11 S., Rs. 7, 7 1/2, and 8 E. Located about 13 miles east of Detroit, bordering the west side of Mt. Jefferson Wilderness Area. It is accessible from the west by a series of Forest Roads: 4685, 4685310, 4685330, 2233650, 2243, 2243440, 2243040, 2246, 2246750, 2253, and 2255; and from a series of Forest Trails: 3361, 3441, 3373, 3421, and 3445.

Geography and Topography This area occurs within the High Cascades Physiographic Province, and is characterized by elevations of from 2,800 to 5,434 feet, with steep talus slopes, rock outcrops, and meadow openings. The area is composed of a series of irregular areas adjacent to the northwest boundary of the Mt. Jefferson Wilderness.

Soils Soil may vary greatly in local areas. Generally soil is about three feet deep and may vary from cobbly to sandy loam. Fertility is low to moderate and and erosion may be severe on steep slopes. There are about 1,941 acres that have potential for severe surface erosion. For more information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetative species include Douglas-fir, Pacific silver fir, mountain hemlock, vine maple, ocean spray, chinquapin, and huckleberry.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock (*Abies-Tsuga*) forest (004).

Current Uses Current uses include hiking, firewood gathering, and timber management. This area attracts hikers on the way into the Mt. Jefferson Wilderness. As of 1985, several timber sales have been planned and sold which include acreage within this unroaded area. Since this area was inventoried in 1984 management activities are estimated to have affected 1,920 acres of the area.

Figure C-4-1

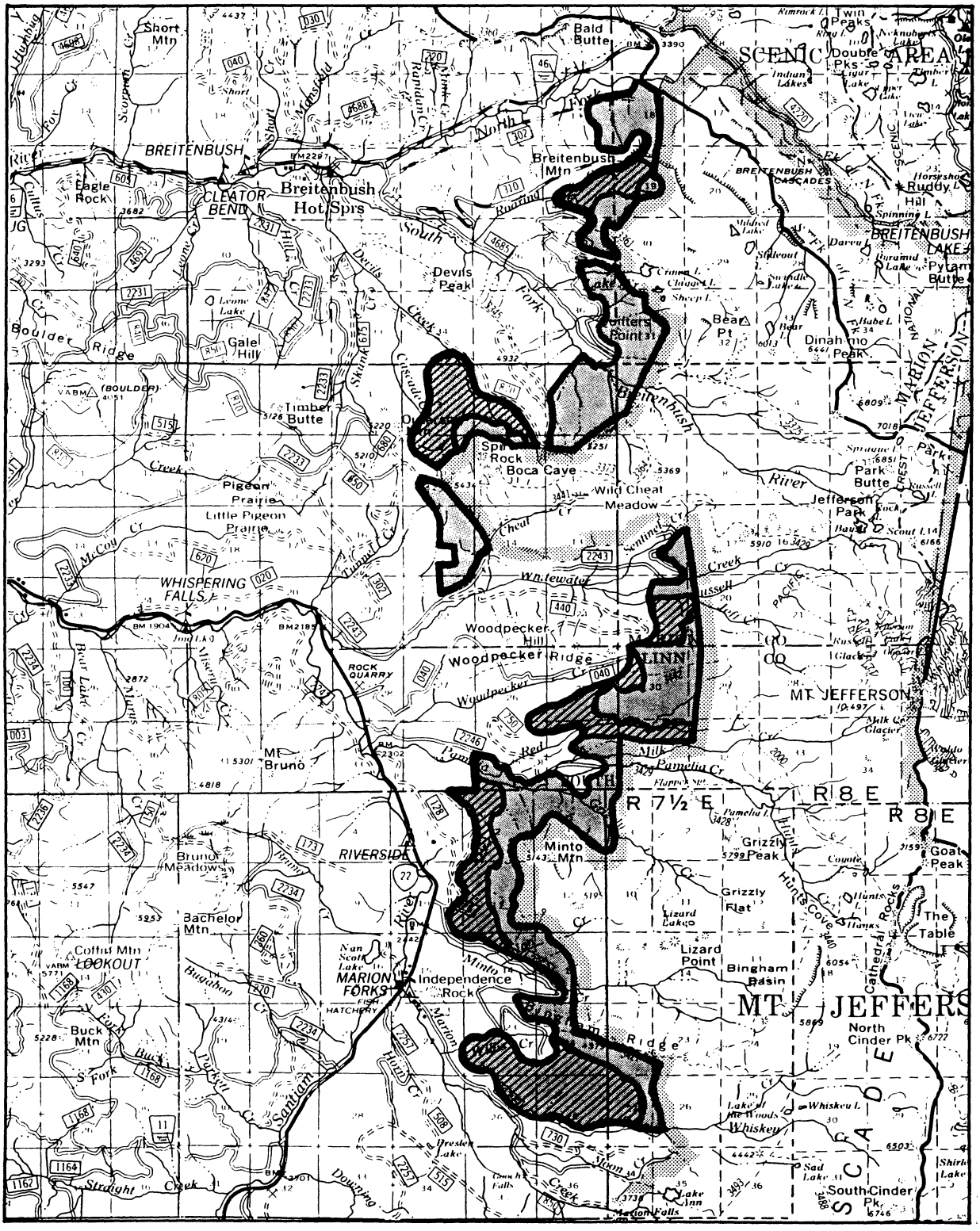
MT. JEFFERSON NORTH

Roadless Areas: 9,684 Acres

Areas affected by management activities (1984-1989): 3,648 Acres

N

0 1 2 3 4 5 Miles



Appearance The area is characterized by a continuous forested canopy with rock outcrops occurring on the slopes. Hillsides contain highly dissected, steep, "V" shaped drainages. Some areas have gentle sloping hillsides that break off steeply into the creek bottoms. Some age and size class diversity of the timber stands exists as a result of past fire history.

Attractions Existing trails that enter the Mt. Jefferson Wilderness, Minto Mountain, and Triangulation Peak are the primary attractions.

Capability

Manageability and Boundaries As of 1985, several timber sales are either sold or will be sold in the near future. The long narrow shape of the area, with possibilities of harvest activity on the west boundary, makes this area relatively hard to manage as wilderness and maintain its primitive character. Sights and sounds of civilization in the narrow portion will be easily detected. Most boundaries do not follow terrain that forms a barrier, but follow the edge of nonconforming uses.

Natural Integrity The natural integrity of the Mt. Jefferson North roadless area is varied. The amount of area occupied by helispots is minimal. Several harvested units are within the area along the edge. The potential for increased disturbance is high since additional timber sales have been sold. Portions of many trails traverse the area.

Evidence of previous wildfire is visible and will remain apparent over 60 to 70 percent of the area for a long time.

Smoke from grass field and slash burning covers almost the entire area periodically during the summer and fall seasons, but apparently does not affect the natural process. Occasionally smoke and air pollution will be apparent from higher elevations and may affect scenic enjoyment. The impact is not permanent.
Natural Appearance Most visitors find the area apparently natural but there are some impacts apparent to some visitors.

Opportunity for Solitude The Mt. Jefferson North roadless area has high potential for solitude. Diversity of topography offers screening potential in at least half the area. Use in the more rugged terrain would tend to be concentrated on top of ridges or in creek bottoms. The area contains dense timber stands and undergrowth which screen people from one another, even within a quarter mile; but there is still sufficient opening to permit travel and camping without undue concentration of people. Offsite intrusions are close-by and intermittent.

Opportunity for Primitive Recreation Opportunities for primitive recreation are high including hiking, fishing, rock scrambling, and camping.

Special Features Prehistoric cultural features are present. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 6,457 Recreation Visitor Days (RVDs) of Semiprimitive Dispersed Nonmotorized recreation use. No potential trail locations have been identified. However, a potential 40 acre campground has been identified in Devils Creek and is located just within the boundary of the roadless area. This potential site could accommodate 50 Persons-At-One-Time (PAOT) and provide 6,000 RVDs of developed recreation use annually.

Wildlife Resource Mt. Jefferson North roadless area extends more than 20 miles north and south along the Mt. Jefferson Wilderness boundary. Topographic conditions and vegetative communities vary greatly from one part of the roadless area to another, therefore an array of wildlife habitats are represented here. Management regimes that develop late successional stands increase quality of old growth stands for spotted owls. Most of the wildlife species found on the Detroit District are represented here.

Water Resource Puzzle Creek has a power withdrawal within the roadless area and the existing Wilderness. Little other potential development of water resource exists.

Timber Resource The area has stands of large, old-growth Douglas-fir and western hemlock. Stands of Pacific silver fir, mountain hemlock and lodgepole pine occur in the higher elevations. The stands generally have high defect which is a characteristic of the old-growth ecosystem. The roadless area includes 204 million board feet growing on about 4,799 acres of land suitable for growing timber under managed conditions. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 648,500 cubic feet per year at culmination of mean annual increment.

Mineral and Energy Resource Portions of the roadless area are within the Breitenbush known Geothermal Resource Area. Geothermal resources have been leased on portions of the roadless areas and other portions are available for leasing.

Cultural Resources Several cultural sites exist most of which are open prehistoric lithic scatters. There are areas of high probability where more sites are suspected.

Land Use Authorizations Portions are either leased or available for lease for geothermal resources.

Management Considerations

Fire Fuel loading averages 50 tons per acre; however, any specific area may vary significantly from this average. Numerous human caused and lightning caused fires have occurred from 1975 to 1985.

Need

Nearby Wilderness and Its Use The Mt. Jefferson Wilderness (105,299 acres) lies adjacent to the roadless area to the east. It was enlarged with the additions designated by the Oregon Wilderness Act of 1984 and receives very heavy use in the Jefferson Park, Pamelia and Marion lakes, and Eight Lakes Basin areas.

Distance from Population Centers The area is between 70 to 80 miles by road southeast of Salem, Oregon.

Interest by Proponents The Mt. Jefferson North roadless area generated a high amount of interest with 56 percent of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Mt. Jefferson North roadless area. In Alternatives NC, K, A, J, and W, 85 to 95 percent of this area will be affected by road construction and timber harvest. Alternative D will develop about 26 percent and Alternative L will develop about 23 percent of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous

to the Mt. Jefferson Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternatives D and L maintain the option of future Wilderness consideration for most of this area. Figure C-4-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Mt. Jefferson North roadless area an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in 74 to 77 percent of D and L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-4-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-4-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA) [1]	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	1,472
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	1,557
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	576	576	576	576	171	64
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	64	64	64	64	--	--
Management Area **9d**	--	235	--	235	256	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	277	--	277	--	--	--	--
Management Area **10e**	--	--	--	--	--	4,287	1,578
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	469	--	576	256	43	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	448	576	85	683
Management Area **11d**	491	--	299	533	384	128	--
Management Area **11e**	--	--	--	--	--	--	405
Management Area **11f**	--	--	--	--	128	149	213
12 Developed Recreation							
Management Area **12a**	43	43	43	43	43	43	43
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	5,226	4,479	4,607	3,370	3,583	1,088	--
15 Riparian [2]							
Management Area **15**	*	*181	*181	*192	171	43	21

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-4-3. Mt. Jefferson North Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	1,472
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	29	--	29	--	--	1,708	766
	Acres	277	--	277	--	--	4,287	1,578
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	3,063	5,211	6,545	8,941	8,941	4,471	14,968
	Acres	533	1,088	1,152	2,090	2,197	619	2,986
Roaded Modified	RVDs	9,852	8,971	8,486	7,689	7,689	2,905	--
	Acres	5,226	4,949	4,607	3,946	3,839	1,130	--
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	4.0	2.0	4.0	3.0	6.0	7.0
Moderate Protection Level	Miles	3.0	1.0	2.0	2.0	6.0	1.0	0.0
Low Protection Level	Miles	5.0	4.0	5.0	3.0	--	1.0	1.0
Potential Trails								
Full Protection Level	Miles	1.0	1.0	1.0	1.0	--	1.0	1.0
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	640	640	640	640	4,458	4,671
Retention	Acres	277	235	277	299	384	149	619
Partial Retention	Acres	533	213	512	1,152	1,173	299	747
Modification	Acres	--	469	--	576	256	43	--
Maximum Modification	Acres	5,266	4,479	4,607	3,370	3,583	1,088	--
1st Decade								
Road Construction	Miles	--	5.0	4.2	8.0	4.6	1.7	0.7
Area Harvested	Acres	--	643	487	1,292	463	193	88
Programmed Timber Harvest	MBF	--	4,053	4,212	10,066	4,111	2,733	607
Area Remaining Undeveloped	%	--	67	75	34	76	90	95
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	4,053	3,648	3,605	3,285	3,072	1,045	469
75-94% of Full Yield	Acres	405	43	256	405	363	107	--
50-74% of Full Yield	Acres	299	320	384	320	363	128	405
30-49% of Full Yield	Acres	--	--	--	--	--	--	43

Mount Jefferson South - 4,991 Acres

Description

History The Mt. Jefferson South roadless area was studied in RARE I and RARE II. The original acreage was about 7,316 acres. The Oregon Wilderness Act of 1984 designated 1,002 acres as Wilderness, releasing 6,314 acres to multiple-use management. Since the release of these lands in 1984, approximately 1,323 acres have been affected by development activities. Several timber sales have physically changed the area along the boundary through harvest operations.

Location and Access Tps. 12 and 13 S., Rs. 7 and 7 1/2 E. Mt. Jefferson South is located about 16 miles southeast of Detroit, bordering the west side of Mt. Jefferson Wilderness. It is accessible by Forest Roads 2261, 2261345, 2267, 2267220, Highway 20, and by Forest Trails 3436, 3490, and 3391.

Geography and Topography This area occurs within the High Cascades Physiographic Province, and is characterized by elevations of from 2,800 to 5,434 feet, with steep talus slopes, rock outcrops, and meadow openings.

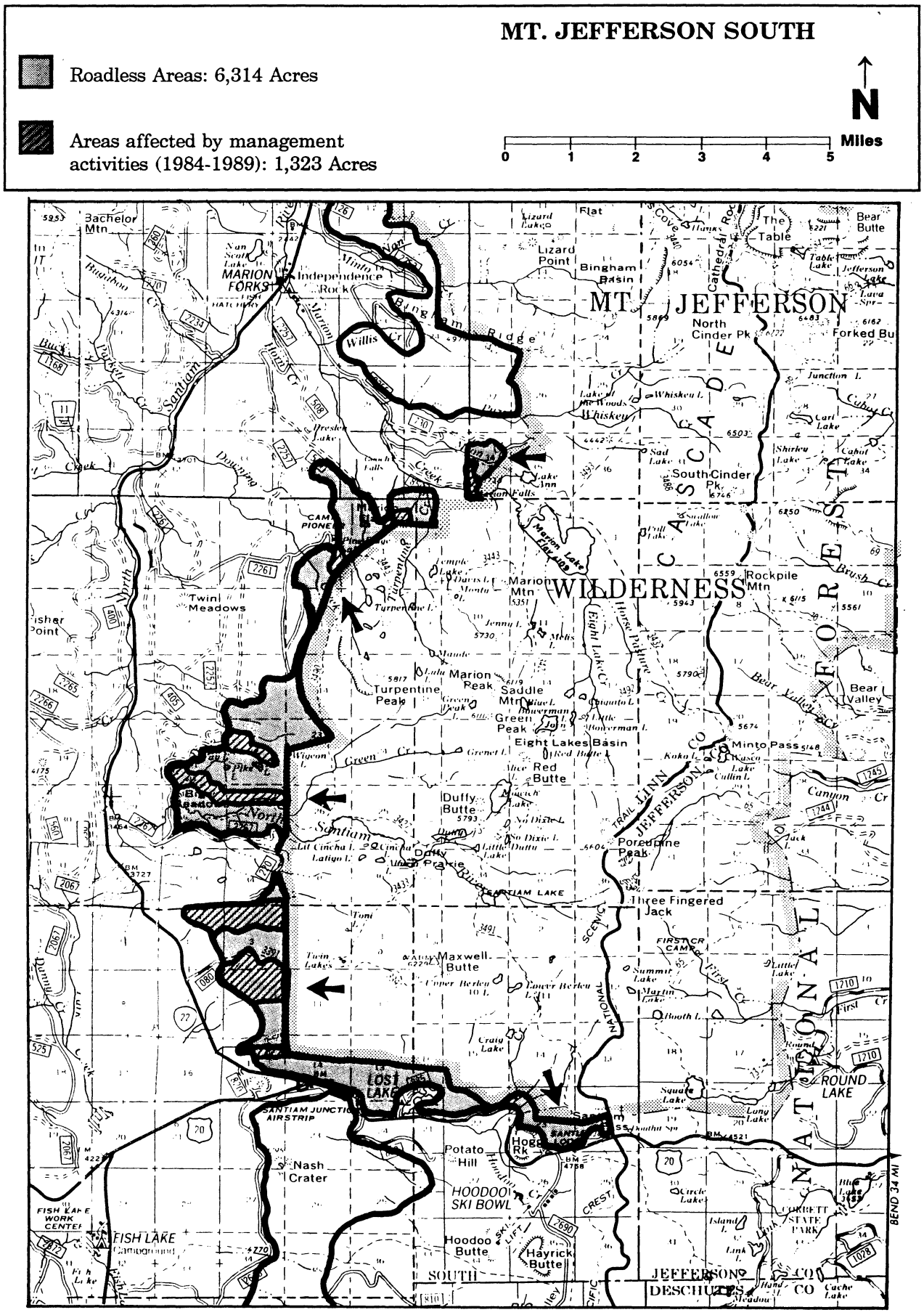
Soils Soils may vary greatly in local areas. Generally, soils are about three feet deep and vary from cobbly to sandy loam. Fertility is low, and erosion may be severe on steep slopes. There are about 491 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetative species include Douglas-fir, Pacific silver fir, mountain hemlock, vine maple, ocean spray, chinquapin, and huckleberry.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock (*Abies-Tsuga*) forest (004).

Current Uses Current uses include hiking, timber commodities, and firewood. As of 1985, there are seven timber sales on contract, seven proposed sales that have approved Environmental Assessments, and six sales that are in the planning phase that lie within the area. Since this area was inventoried in 1984 management activities are estimated to have affected 1,120 acres of the area.

Figure C-5-1


MT. JEFFERSON SOUTH
Roadless Areas: 6,314 Acres
Areas affected by management activities (1984-1989): 1,323 Acres
N
0 1 2 3 4 5 Miles
MT. JEFFERSON WILDERNESS
CASCADE
MT. JEFFERSON
North Cinder Pk
South Cinder Pk
Rockpile Mtn
Marion Mtn
Marion Peak
Turpentine Peak
Saddle Mtn
Green Peak
Eight Lakes Basin
Red Butte
Duffy Butte
Porcupine Peak
Three Fingered Jack
Maxwell Butte
Lost Lake
Potato Hill
Nash Crater
Hoodoo Butte
Hayrick Butte
Bachelor Mtn
Lizard Point
Bingham Basin
The Table
Bear Butte
Forked Bu
Whiskey
Carl Lake
Shirley Lake
Cabot Lake
Twin Meadows
Bear Valley
Minto Pass
Canyon Cr
Round Lake
Corbett State Park
Fish Lake
Fish Lake Work Center
Fish Lake Campground
Santiam Junction Airstrip
Hoodoo Ski Bowl
Santiam Lake
Deschutes
Jefferson
Linn
Cache
Bend 34 Mi
Willamette National Forest

Appearance This area is characterized by a continuous forested canopy with rock outcrops occurring on the slopes. Hillsides contain highly dissected, steep, "V" shaped drainages. Some areas have gentle sloping hillsides that break off steeply into the creek bottoms. Age and size class diversity of the timber stands exists as a result of past fire history.

Attractions Big Meadows, Fay Lake, Pika Lake, Fir Lake, Pine Ridge Lake, Camp Pioneer, existing trails, and Wilderness trailheads are the primary attractions. Spectacular views of Mt. Jefferson and the surrounding forest are available from some of these locations.

Capability

Manageability and Boundaries With possibilities of harvest activity on the west boundary, makes this area relatively hard to manage as wilderness and maintain its primitive character. Sights and sounds of civilization along the west boundary would be easily detected. Most boundaries do not follow terrain that forms a barrier, but follow the edge of nonconforming uses.

Natural Integrity Management activities such as helispots and clearcuts are present. The potential for impact is high since seven timber sales have been sold. Fourteen trails traverse the area.

Smoke from grass field and slash burning covers the entire area periodically during the summer and fall seasons, but does not apparently affect the natural process. Smoke and air pollution will be apparent from higher elevations and may affect scenic enjoyment. The impact is not permanent. Evidence of previous wildfires is visible on 60 to
70 percent of the area.

Natural Appearance Most visitors find the roadless area apparently natural but there are some impacts apparent to some visitors.

Opportunity for Solitude The Mt. Jefferson South roadless area has high potential for solitude. Diversity of topography offers screening potential in at least half the area. Use in the more rugged terrain would be concentrated on top of ridges or in creek bottoms. The area contains dense timber stands and undergrowth which screen people from one another, even within a quarter mile; but there is still sufficient opening to permit travel and camping without undue concentration of people. Offsite intrusions are close-by and permanent. Aircraft and highway traffic may be heard.

Opportunity for Primitive Recreation Opportunities for primitive recreation are varied. The area contains steep terrain, a variety of vegetation, and one stream. Facilities consist of many trails, two pit toilets at Big Meadows, and Camp Pioneer Boy Scout Camp.

Special Features The area generally contains fairly common features. Cultural features are present. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Recreation Resource The area provides a travel corridor and buffer to the Mt. Jefferson Wilderness. The roadless area contains a few small high mountain lakes, a large wet meadow and a Boy Scout Camp which receive moderate use. The other portions of the roadless area are used primarily as a passage way to the existing Wilderness. Capacity estimates indicate that this area could provide 11,517 Recreation Visitor Days (RVDs) of Semiprimitive Dispersed Motorized recreation use. Provide access and disperse visitors in the area.

The undeveloped horse camp at Big Meadows receives heavy use. Potential exists for development.

Two potential snow play sites have been identified along the southern boundary. One site is 10 acres and could accommodate 150 Persons-At-One-Time (PAOT) and provide 7,200 Recreation Visitor Days (RVDs); the second site is 20 acres and could accommodate 150 PAOT and provide 9,000 RVDs of developed site use.

Wildlife Resource The roadless area receives extensive use by big game as summer range. Forage is plentiful, resulting in the presence of large numbers of Roosevelt elk and black-tailed deer. Other species common to the western slopes of the Cascade Range are present.

Mt. Jefferson South roadless area extends more than 20 miles north and south along the Mt. Jefferson Wilderness boundary. Topographic conditions and vegetative communities vary greatly from one part of the roadless area to another, therefore a vast array of wildlife habitats are represented here. Management regimes that develop late successional stands increase quality of old growth stands for spotted owls. Most of the wildlife species found on the Detroit District are represented here. Proper design and location of harvest units could enhance big-game populations.

Water Resource Puzzle Creek has a power withdrawal within the roadless area and the existing Wilderness. Little other potential for development of the water resource exists.

Timber Resource There are stands of large, old-growth Douglas-fir and western hemlock in the area with stands of Pacific silver fir, mountain hemlock and lodgepole pine in the higher elevations. The stands generally have high defect which is a characteristic of the old-growth ecosystem. The roadless area includes about 147 million board feet on about 4,202 acres of land suitable for growing timber under managed conditions. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 512,136 cubic feet per year at culmination of the mean annual increment.

Mineral and Energy Resource Nearly 5,000 acres of the roadless area is within the Belknap- Foley Geothermal Study Area. Geothermal resources have been leased on portions of the roadless areas and other portions are available for leasing.

Cultural Resources Several cultural sites exist.

Land Use Authorizations Camp Pioneer has been operated under a special use permit by the Cascade Area Council of the Boy Scouts of America for approximately 40 years. Portions of the area are either leased or available for lease for the geothermal resources.

Management Considerations

Fire Fuel loading averages 50 tons per acre; however, any specific area may vary significantly from this average. Numerous human caused and lightning caused fires have occurred from 1975 to 1985.

Need

Nearby Wilderness and Its Use The Mt. Jefferson Wilderness (105,299 acres) is adjacent to the roadless areas on the east. The Wilderness was enlarged with additions designated by the Oregon Wilderness Act of 1984. It receives very heavy use in the Jefferson Park, Pamelia and Marion Lake, and Eight Lakes Basin areas.

Distance from Population Centers The area is approximately 85 miles by road southeast of Salem, and about 75 miles east of Albany, Oregon.

Interest by Proponents The Mt. Jefferson North roadless area generated a high amount of interest with 44 percent of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Mt. Jefferson South roadless area. In Alternatives NC, K, A, J, and W, 51 to 55 percent of this area will be affected by road construction and timber harvest. Alternative D will develop 22 percent of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Mt. Jefferson Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternative D and L maintains the option of future Wilderness consideration for a majority of this area. Figure C-5-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Mt. Jefferson South roadless area an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and 78 percent of D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-5-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-5-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	2,496
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	939	1,194	1,152	1,152	85	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	128	128	128	128	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	1,621	512
Management Area **10d**	2,240	--	1,109	725	704	--	--
Management Area **10e**	--	--	--	--	--	1,642	1,813
Management Area **10f**	--	661	--	277	277	555	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	896	--	853	704	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	149	--	299	149	640	--
Management Area **11d**	277	--	277	107	213	64	--
Management Area **11e**	--	192	--	--	192	--	--
Management Area **11f**	149	256	107	235	192	256	107
12 Developed Recreation							
Management Area **12a**	64	64	64	64	64	64	64
Management Area **12b**	--	21	--	21	21	21	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	2,261	1,642	2,090	1,109	1,152	43	--
15 Riparian [2]							
Management Area **15**	*	*42	*21	*21	43	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-5-3. Mt. Jefferson South Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	2,496
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	2,352	--	1,053	672	661	1,703	1,976
	Acres	2,240	--	1,109	725	704	1,642	1,813
Semiprimitive Motorized	RVDs	--	--	--	--	--	4,512	1,517
	Acres	--	--	--	--	--	1,621	512
Roaded Natural	RVDs	5,014	26,329	19,562	24,748	26,082	18,178	1,976
	Acres	491	2,453	1,792	2,304	2,432	1,685	171
Roaded Modified	RVDs	9,511	10,327	8,790	8,220	7,746	190	--
	Acres	2,261	2,538	2,090	1,962	1,856	43	--
Trails								
Existing Trails								
Full Protection Level	Miles	2.0	5.0	4.0	5.0	2.0	7.0	8.0
Moderate Protection Level	Miles	5.0	0.0	3.0	1.0	7.0	2.0	--
Low Protection Level	Miles	2.0	4.0	2.0	3.0	--	--	--
Potential Trails								
Full Protection Level	Miles	0.0	1.0	1.0	1.0	--	1.0	2.0
Moderate Protection Level	Miles	0.0	--	--	--	2.0	--	--
Low Protection Level	Miles	1.0	1.0	1.0	2.0	--	1.0	--
Visual Quality Objectives								
Preservation	Acres	--	1,066	1,322	1,280	1,280	1,728	4,309
Retention	Acres	2,389	1,109	1,216	1,237	1,365	2,432	619
Partial Retention	Acres	341	277	363	512	491	789	64
Modification	Acres	--	896	--	853	704	--	--
Maximum Modification	Acres	2,261	1,642	2,090	1,109	1,152	43	--
1st Decade								
Road Construction	Miles	--	1.4	3.0	5.0	4.0	0.4	0.1
Area Harvested	Acres	--	190	268	824	377	95	--
Programmed Timber Harvest	MBF	--	826	2,344	6,409	3,298	577	78
Area Remaining Undeveloped	%	--	88	83	49	76	94	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	2,090	2,112	1,962	1,984	1,557	576	--
75-94% of Full Yield	Acres	213	128	213	107	363	64	--
50-74% of Full Yield	Acres	1,834	320	747	640	725	213	107
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Middle Santiam - 6,783 Acres

Description

History Although the area boundaries have since changed, the Middle Santiam roadless area was studied in Rare I and Rare II. The Oregon Wilderness Act of 1984 set aside 8,553 acres as the Middle Santiam Wilderness and released 15,827 acres for multiple-use management. Since the release of these lands in 1984, approximately 9,044 acres have been affected by development activities.

Location and Access Tps.11 and 12S., Rs.4, 5, and 6E. This roadless area lies within the Sweet Home Ranger District approximately 40 miles northeast of Sweet Home. Forest Road 11 borders on the north, Forest Road 2041 borders the south, and access to the interior is provided by Forest Trails 3382 and 3387.

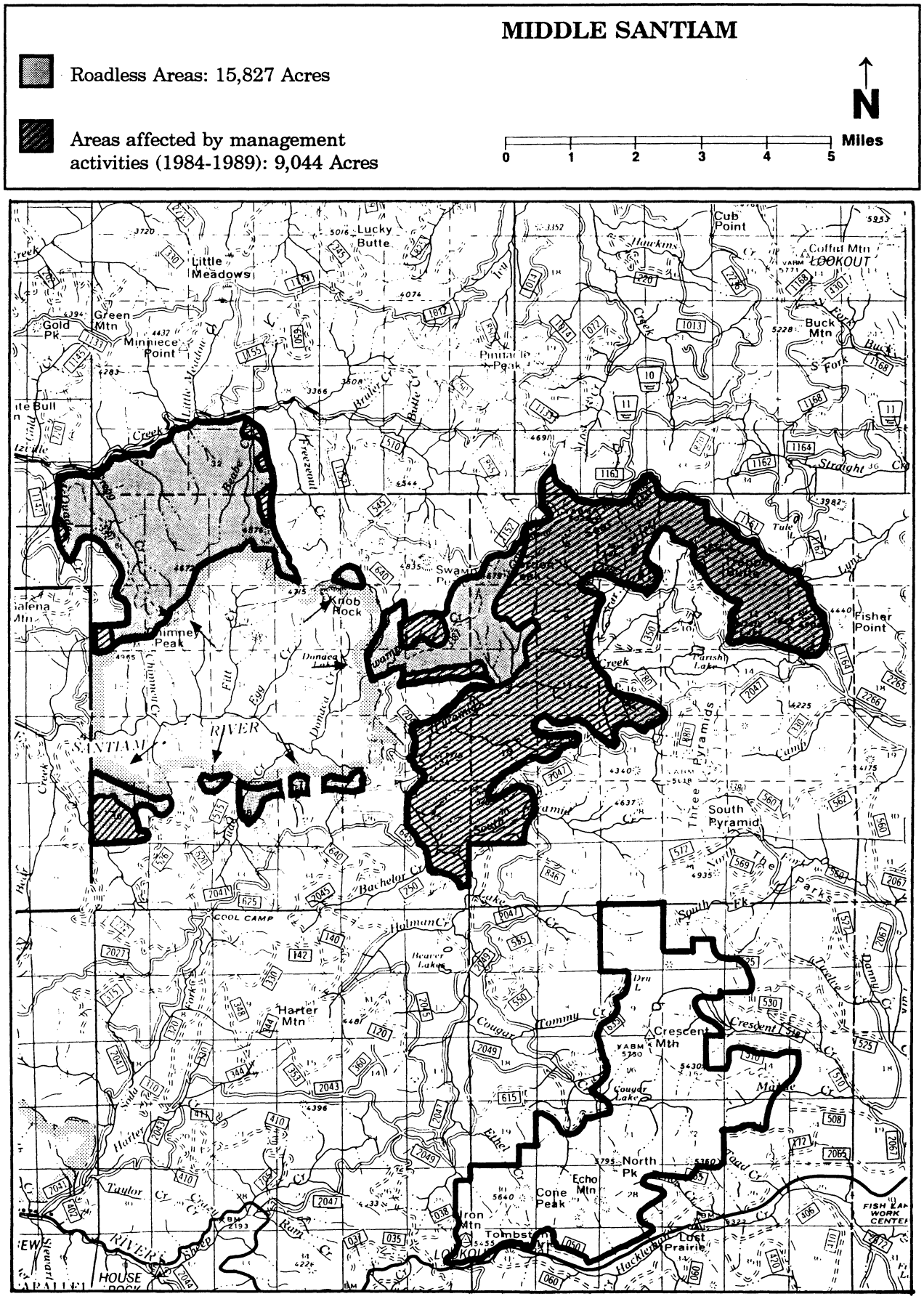
Geography and Topography A wide variety of topography ranging from steep slopes, high peaks and ridges, to more gentle slopes and benches is evident with elevations ranging from 2,000 feet along the Middle Santiam River to 5,022 feet on Scar Mountain.

Soil The Quartzville area (north area) is comprised of steep, highly dissected landforms developed on green and red breccias and tuffs. Soils generally have numerous rock fragments and range from less than 1-foot deep along ridgetops to more than 15 feet deep along drainages with 2 to 4 feet on the midslopes. The Pyramid Creek area (east area) is characterized by uneven to hummocky benches and basins, often separated by rocky scarps. Soils on the flatter areas are relatively deep and fertile. Bedrock is variable but consists primarily of breccias and tuffaceous materials. These soils are unstable once they are disturbed and maybe prone to erosion. There are about 4,373 acres that have potential for severe surface erosion; and approximately 3,050 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetation varies from true fir associations at upper elevations to Douglas-fir/western hemlock at lower elevations.

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-6-1


MIDDLE SANTIAM
Roadless Areas: 15,827 Acres
Areas affected by management activities (1984-1989): 9,044 Acres
N
0 1 2 3 4 5 Miles
Lucky Butte
Little Meadows
Cub Point
Coffut Mtn
LOOKOUT
Green Mtn
Gold Pk
Minniece Point
Buck Mtn
S Fork
Straight
Knob Rock
Chimney Peak
Fisher Point
SANTIAM RIVER
South Pyramid
Three Pyramids
Harter Mtn
Crescent Mtn
North Pk
Echo Mtn
Cone Peak
Iron Mtn
Lost Prairie
HOUSE ROCK
FISH LAB WORK CENTER

Current Uses At present there is little evidence of use, due partly to the lack of access and partly because of the limited number of attractions. The Recreation Opportunity Spectrum (ROS) class is Semiprimitive Nonmotorized. Current management direction is to practice multiple-use management of all resources with an emphasis on sustained timber yield. The Middle Santiam attracts about 11,500 Recreation Visitor Days (RVDs) for such activities as fishing, hunting, and hiking. Since this area was inventoried in 1984 management activities are estimated to have affected 2,240 acres of the area.

Appearances The variety in conifer timber types, understory vegetation, meadows and rock outcrops make this area typical of the Western Cascades.

Surroundings Roads have been developed and timber has been harvested around the perimeter. Several placer and lode mining claims are being operated along Quartzville Creek and McQuade Creek.

Attractions Daly, Don, and Riggs lakes are primary attractions of interest in the area. Daly Lake is a popular dispersed recreation destination surrounded by old-growth forests. Mid-elevation natural appearing lakes like Daly Lake are becoming uncommon as more development takes place throughout the Cascades. Don and Riggs lakes are secluded by the surrounding forest and terrain. The true fir stands dwarf the parklike understory. The meadows in the area attract big-game and the lakes provide habitat for small native fish. The Middle Santiam River and the lower extremities of its tributaries support native and anadromous fish.

Capability

Manageability and Boundaries The shape (long and narrow) of the east area, with harvest activity on all but the west boundary, makes this area relatively hard to manage as wilderness and maintain its primitive character. Sights and sounds of civilization in the narrow portion will be easily detected. Most boundaries do not follow terrain that forms a barrier, but follow the edge of nonconforming uses.

Natural Integrity There are roads and cutting units present. Three maintained trails traverse the Middle Santiam roadless area, totaling 11.0 miles. Present trails do not measurably alter the natural processes.

Recreation facilities that are present include Shed Camp Shelter near Pyramid Creek, McQuade Creek shelter near McQuade Creek, and a pit toilet at Daly Lake. These facilities have stopped natural processes in their immediate proximity. Daly Lake receives a high amount of recreation use resulting in compaction of the soil, deterioration of the vegetation, and pollution of the lake.

Other fixed site facilities in the area are helispots at Gordon Peak and an unnamed peak two miles north of Chimney Peak. The natural processes continue to operate largely uninterrupted at these locations.

Smoke from grass field and slash burning covers the entire area periodically during the spring, summer and fall seasons, but apparently does not affect the natural process. Smoke and air pollution will be visible to the visitor from higher elevations and will affect scenic enjoyment.

Natural Appearance Most visitors would find the roadless area apparently natural when roads and cutting units are separated from the area.

Opportunity for Solitude North and east portions offer moderate opportunity for solitude. Diversity of topography in the form of benches and rolling slopes offers screening potential in at least half of

the area but may be limited or lacking in the remainder. Most of the roadless area has dense vegetation, which screens people from one another at short distances. There is still sufficient opening to permit travel and camping without undue concentration. Noises from air traffic, mining activity, and surrounding timber harvest operations are the most perceptible offsite intrusions. The sounds are transitory in nature.

Opportunity for Primitive Recreation Primitive recreation opportunities are moderate, with the Middle Santiam River and tributaries, Daly Lake, Don Lake, and Riggs Lake providing the only diversity to a homogeneous Douglas-fir forest. Developments are limited to trails maintained to a low standard, two shelters, and one pit toilet.

Special Features The area generally contains fairly common features. Spotted owl responses have been recorded in the area. Sensitive plant species habitat exists in the roadless area. However, no federally listed endangered or threatened species are known to be present. Twenty-four cultural resource sites have been recorded in the area. Interest has been expressed about 108 acres of actively unstable terrain manifesting: leaning trees, hummocky ground, tension cracks, seeps, and debris chutes.

Availability

Resource Potentials

Wildlife Resource The Middle Santiam roadless area includes critical big game winter range (107 acres) at low elevations along the Middle Santiam River and is used moderately as summer range by deer and elk at the higher elevations. Development, dependent upon harvest design and access control, would improve carrying capacity for seral stage species. However, a reduction in old-growth stands will gradually reduce habitat for old-growth dependent species. Developing the Middle Santiam drainage for an anadromous fisheries is dependent upon the development of fish passage across Foster and Green Peter dams. A resident fishery exits in several small streams and lakes. Habitat parallel with the Middle Santiam River is considered potential nesting habitat for the bald eagle and osprey.

Timber Resource The roadless area includes about 6,271 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir occupy the area representing about 294 million board feet. Site productivity ranges from Class III to Class V. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 876,740 cubic feet per year at culmination of the mean annual increment.

Mineral and Energy Resource The Quartzville area (north portion) contains two existing active placer and lode mining claims. These claims run from the confluence of McQuade Creek with Quartzville Creek on McQuade Creek south for approximately 4,500 feet. A road has been constructed on the east side of McQuade Creek and runs for approximately 2,000 feet south of Quartzville Creek. In the summer of 1984 an operation was being conducted where soils and gravels were dug from the stream bank and run through a dredge. No other claims exist within the unroaded area, though a potential exists on two tributaries to Quartzville Creek, Beabe Creek and Gregg Creek.

Recreation Resource Capacity estimates indicate that this area could provide 4,696 RVDs of Semiprimitive Dispersed Nonmotorized recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. No potential developed recreation sites have been identified.

Cultural Resource Several sites have been identified in the area. These upland sites contain primarily lithic material, and are believed to be related to the seasonal camps of the aboriginal people. More sites are probable.

Management Considerations

Fire From 1965 to 1985, the majority of fires have been small (less than 1 acre) lightning strikes and a few human caused fires. The average occurrence is approximately 2 per year. Fuel loading ranges from 30 to 130 tons per acre in old-growth stands (150 years plus) and 10 to 40 tons per acre in younger stands (80 to 150 years).

Insects and Disease Normal endemic diseases are found; there is no documentation of past infestations of insects or diseases. A potential for infestation by both the western spruce budworm and gypsy moth exists, as they have occurred in nearby forests. Scattered pockets of root rot, *Phellinus wierii*, are found throughout the area.

Need

Nearby Wilderness and Its Use The Middle Santiam Wilderness (8,553 acres) lies adjacent to the roadless area, and the Menagerie Wilderness (5,033 acres) is 15 miles southwest. These Wildernesses were created by the Oregon Wilderness Act of 1984. To the east 10 miles is the Mt. Jefferson Wilderness (105,299 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 55 miles by road to the east of Albany, Oregon.

Interest by Proponents The Middle Santiam roadless area generated a high amount of interest with 52% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Middle Santiam roadless area. In all Alternatives, 10 to 98% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternative L, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Middle Santiam Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternatives L and D maintains the option of future Wilderness consideration for most of this area. Figure C-6-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Middle Santiam roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, and J. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and 78% of D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-6-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-6-2)

	Alternatives						
Management Areas	**NC** (No Change)	**K** (WFC)	**A** (No Action)	**J** (DEIS-PA)	**W** (PA)	**D** (Wildlife)	**L** (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	3,967
Management Area **1c**	--	--	--	--	--	--	128
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	85
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	2,026
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	171	171	171	171	--	--
Management Area **9d**	--	--	--	--	--	--	21
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	1,728	--
Management Area **10e**	--	--	--	--	--	3,967	21
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	384	277	384	789	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	--	--	--	--	21	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	6,399	6,058	5,951	3,391	6,335	917	512
15 Riparian [2]							
Management Area **15**	*	*277	*277	*107	277	149	21

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-6-3. Middle Santiam Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	4,095
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	1,978	--
	Acres	--	--	--	--	--	5,695	21
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	4,150	4,174	5,409	4,421	1,260	1,507	16,720
	Acres	384	725	832	1,237	448	171	2,154
Roaded Modified	RVDs	8,790	8,752	8,277	8,657	9,909	2,203	1,310
	Acres	6,399	6,058	5,951	5,546	6,335	917	512
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	1.0	1.0	1.0	3.0	5.0	7.0
Moderate Protection Level	Miles	3.0	3.0	3.0	6.0	4.0	3.0	--
Low Protection Level	Miles	4.0	4.0	4.0	1.0	--	--	--
Potential Trails								
Full Protection Level	Miles	0.0	0.0	0.0	0.0	3.0	7.0	8.0
Moderate Protection Level	Miles	0.0	1.0	2.0	3.0	5.0	--	--
Low Protection Level	Miles	7.0	7.0	7.0	6.0	--	1.0	--
Visual Quality Objectives								
Preservation	Acres	--	171	171	171	171	3,967	6,143
Retention	Acres	--	--	--	--	--	1,749	21
Partial Retention	Acres	384	555	661	1,066	277	149	107
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	6,399	6,058	5,951	5,546	6,335	917	512
1st Decade								
Road Construction	Miles	--	6.0	5.0	3.0	5.5	3.1	0.4
Area Harvested	Acres	--	929	1,026	554	793	347	104
Programmed Timber Harvest	MBF	--	8,372	9,542	5,059	7,047	6,958	939
Area Remaining Undeveloped	%	--	59	54	75	64	84	95
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	5,546	5,290	5,183	4,799	4,394	811	405
75-94% of Full Yield	Acres	640	597	704	1,088	235	--	--
50-74% of Full Yield	Acres	85	213	213	213	768	1,728	128
30-49% of Full Yield	Acres	--	--	--	--	--	--	21

Echo Mountain - 7,551 Acres

Description

History Although the area boundaries have since changed due to roading and cutting units, the Echo Mountain roadless area was studied in Rare I and was considered for Wilderness in the Willamette National Forest Environmental Impact Statement of 1977. The Echo Mountain roadless area was considered for Wilderness by the United States Congress. They released the area for multiple use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 533 acres have been affected by development activities.

Location and Access T.13S., R.6E. This roadless area lies within the Sweet Home Ranger District approximately 45 miles northeast of Sweet Home. Forest Roads 2029 and 2029038 provide access on the west, Forest Roads 2067525 and 2067530 provide access on the northeast, and U.S. Highway 20 and Forest Road 050 provide access on the south. Forest Trails 5430 and 5640 provide access to the interior.

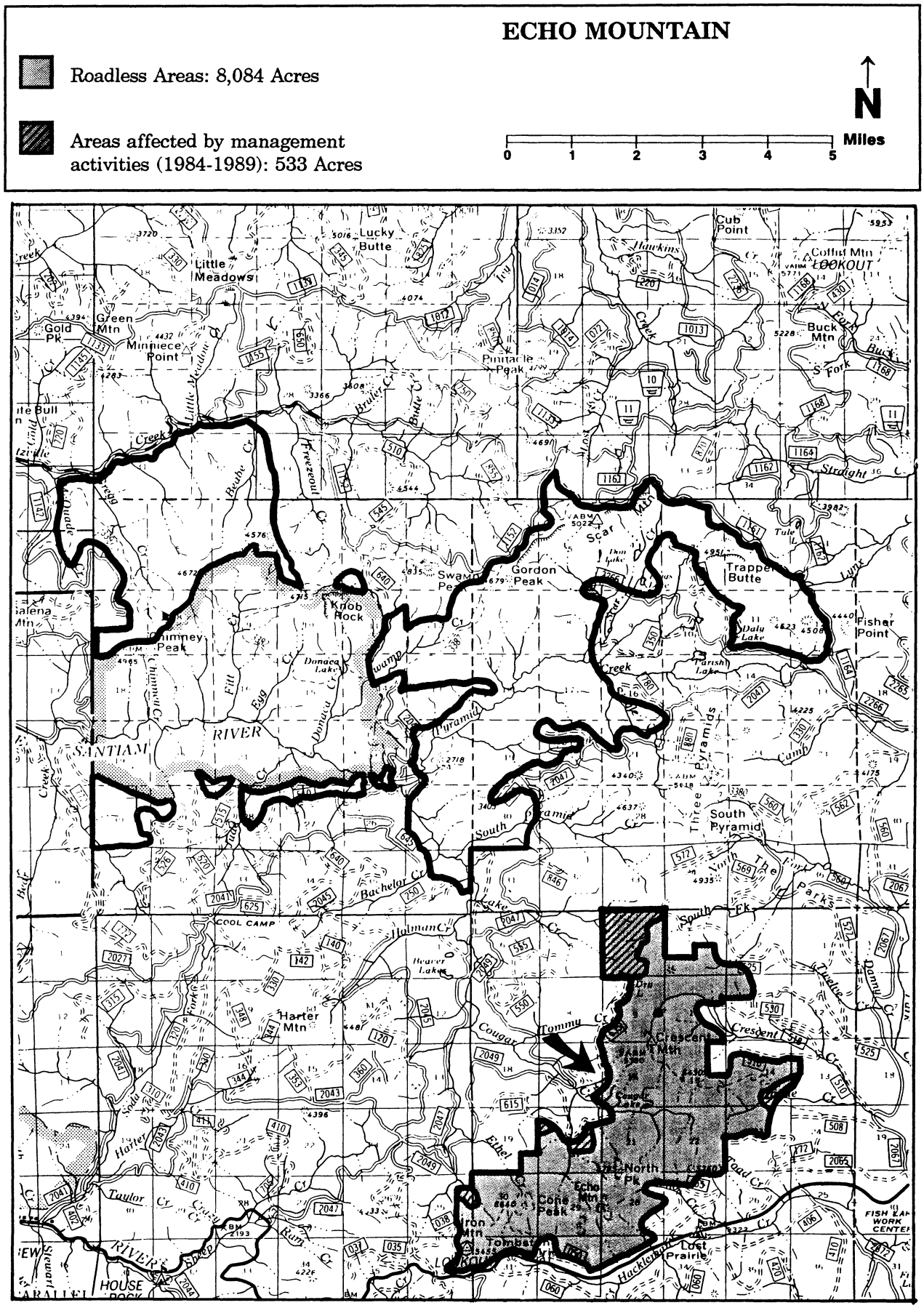
Geography and Topography The elevation ranges from 4,000 to 5,800 feet, with six mountain peaks over 5,000 feet. Crescent Mountain is situated in the northern portion and is separated from the other peaks, which are grouped in the southern portion, by a saddle of about 4,000 feet. There is a wide variety of topography, from cliffs and spires on Iron Mountain, volcanic rocks and uplifts on Echo Mountain, undulating ridges on Crescent Mountain to gentle slopes in the Maude and Cougar Creek headwaters.

Soil Soils in the Echo Mountain roadless area are shallow, rocky, and generally have a low timber production potential. There are about 1,429 acres that have potential for severe surface erosion and approximately 64 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Ecosystem Type and Vegetation There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses The Iron Mountain-Cone Peak area has been used by faculty from local universities as a field laboratory for plant identification and classification. Primary uses are for recreational pursuits including hiking, scenic viewing, berry picking and general observation of existing geology. Recreation Visitor Days (RVDs) approach 22,800. Hunting and fishing are not significant or important uses. The Recreation Opportunity Spectrum (ROS) class is Semiprimitive Nonmotorized. By current management direction, 700 acres have been allocated to Undeveloped Roadless Recreation (FLMP 1977).

Figure C-7-1


ECHO MOUNTAIN
Roadless Areas: 8,084 Acres
Areas affected by management activities (1984-1989): 533 Acres
N
0 1 2 3 4 5
Miles
Little Meadows
Lucky Butte
Cub Point
Coffin Mtn LOOKOUT
Green Mtn
Gold Pk
Minniece Point
Pinnacle Peak
Buck Mtn
S Fork
Gordon Peak
Trapper Butte
Fisher Point
Knob Rock
Chimney Peak
SANTIAM RIVER
Donaca Lake
Swamp Pk
Pyramid
Three Pyramids
South Pyramid
Bachelor Cr
COOL CAMP
Hoffman Cr
Beaver Lakes
Harter Mtn
Tommy Cr
Cougar
Crescent Mtn
Crescent
Taylor Cr
Iron Mtn
Tombstone
Cone Peak
Echo Mtn
North Pk
Lost Prairie
Huckleberry
Road Cr
HOUSE ROCK
FISH LAD WORK CENTE

The objective is to maintain or enhance recreation opportunities in a near natural environment.

Appearances The high meadows and rocky areas along Echo Mountain Ridge are surrounded by forests which contains a variety of coniferous species.

Surroundings Roads have been developed and timber has been harvested around the perimeter of the roadless area. Several mineral claims containing emery and emery-like material have been staked on, and adjacent to, the west side.

Attractions Crescent Lake, Crescent Mountain, and Iron Mountain Trails are primary among the attractions. They provide scenic views of the Cascades, numerous alpine meadows for plant identification, and short day hikes on well established trails.

Capability

Manageability and Boundaries The small size and juxtaposition to the highway and harvest activities (Sights and sounds of civilization) limit the ability to retain a primeval character. Boundaries tend to be located adjacent to nonconforming uses rather than shielding terrain features. Adequate motor vehicle access to boundaries exists on all sides.

Natural Integrity A Forest Service lookout building located on Iron Mountain, and trails to Iron Mountain and Crescent Mountain are the major structures. Natural processes continue to operate largely uninterrupted in the area.

Mineral developments (emery mining), 0.2 mile of road, and a 25 acre partial cut are located in the roadless area.

Other fixed site facilities in the area are helispots on Crescent Mountain, in the saddle between Cone Peak and South Peak, one mile north of Crescent Lake, and on Iron Mountain.

Smoke from grass field and slash burning covers virtually the entire area periodically during the spring, summer and fall seasons; but apparently does not affect the natural process.

Natural Appearance Most visitors find the roadless area apparently natural when physical developments are separated. Evidence of unnaturalness is either absent or apparent to only the most knowledgeable visitor. Smoke and air pollution will be apparent to the visitor from higher elevations and may affect scenic enjoyment.

Opportunity for Solitude The unroaded area offers a low opportunity for solitude. The distance from the perimeter to the approximate geographic center is less than one mile. Most of the area is within sight or sound of roads and development activity on adjacent lands.

Opportunity for Primitive Recreation Primitive recreation opportunities are low because of the limited opportunities for solitude. Developments are limited to 10 miles of trails maintained to a low standard and a lookout. There are 4 lakes including Crescent and Cougar lakes. Crescent Lake offers opportunities for fishing. The Echo Mountain Ridge area provides opportunities for hiking, photography, and scenic viewing.

Special Features The area contains a Iron Mountain Lookout for fire detection. There are no federally listed endangered or threatened species known to be present.

Availability

Resource Potentials

Timber Resource The roadless area includes about 4,010 acres of land suitable for growing timber under managed conditions. Stands of mature true fir and mountain hemlock occupy the area representing about 186 million board feet. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 498,139 cubic feet per year at culmination of the mean annual increment.

Wildlife Resource The Echo Mountain roadless area includes a scattering of high mountain meadows and openings amid varied timber types. This high degree of interspersion of plant communities supports a wide diversity of wildlife and unique/sensitive plant species. The area is also heavily used by deer and elk as summer range. Development and timber harvesting is restricted by the unsuitability of much of the area. Several small lakes support a native trout fishery.

Mineral and Energy Resource An emery mining operation covering half an acre north of Cone Peak has removed the top three feet of earth. Further mining is planned for the future as of 1985. No other claims exist, though there is potential for emery mining adjacent to the existing claim.

Land Use Authorization A radio relay station on Iron Mountain has been authorized for state law enforcement use.

Recreation Resource Capacity estimates indicate that this area could provide 3,940 RVDs of Semiprimitive Dispersed Nonmotorized recreation use. Potential trails have been identified and could provide access and disperse visitor use. A potential visitor information site has been identified which could accommodate 50 persons-at-one-time (PAOT) and provide 7,300 RVDs annually.

Management Considerations

Fire From 1965 to 1985, the majority of fires have been small (less than 1 acre) lightning strikes, and a few human caused fires. The average occurrence is approximately 1 per year. Fuel loadings range from 30 to 130 tons per acre in old-growth stands (150 years plus) and 10 to 40 tons per acre in younger stands (80 to 150 years).

Insects and Disease Normal endemic diseases are found. There is a pocket of dwarf mistletoe covering approximately 50 acres north of South Peak. A potential for infestation by the western spruce budworm and gypsy moth exists, as they have occurred in nearby forests. Scattered pockets of root rot, *Phellinus weirii*, are found throughout the timbered area.

Need

Nearby Wilderness and Its Use Four Wildernesses are within 10 miles of the Echo Mountain roadless area. These include the Middle Santiam Wilderness (8,553 acres) to the northwest, the Menagerie Wilderness (5,033 acres) to the west, to the east 10 miles is the Mt. Jefferson Wilderness (105,299 acres), and Mt. Washington Wilderness (56,202 acres) to the southeast. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 65 miles by road to the east of Albany, Oregon.

Interest by Proponents The Echo Mountain roadless area generated a high amount of interest with 75% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Echo Mountain roadless area. In Alternative K, 93% of this area will be affected by road construction and timber harvest. Alternative NC, A, J, and W will develop 19 to 32% of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with Alternatives B and I, would alter the suitability of this area for future Wilderness consideration. All other Alternatives would maintain the option of future Wilderness consideration for most of this area. Figure C-7-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Echo Mountain roadless area an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternative K. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives NC, A, J, and W, 98% of D, and 100% of L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-7-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-7-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	7,146
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	107	2,538	107	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	43	--	43	43	--	43	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	363	128	149	128	64	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	171	43	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	85
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	320
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	5,077	--	5,077	6,058	3,391	7,167	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	2,666	--	427	832	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	43	--	--	--
Management Area **11d**	64	--	64	43	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	277	491	192	320	341	171	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	2,090	3,711	1,962	363	299	--	--
15 Riparian [2]							
Management Area **15**	*	*149	*42	*--	21	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-7-3. Echo Mountain Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	7,146
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	1,998	--	1,998	2,950	2,363	3,976	--
	Acres	5,077	--	5,077	6,058	3,391	7,167	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	804
	Acres	--	--	--	--	--	--	320
Roaded Natural	RVDs	3,631	8,521	4,545	5,335	9,632	3,384	741
	Acres	384	1,173	512	704	3,029	384	85
Roaded Modified	RVDs	7,404	13,536	7,043	3,113	3,626	--	--
	Acres	2,090	6,378	1,962	789	1,130	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	6.0	6.0	7.0	8.0	8.0	8.0	9.0
Moderate Protection Level	Miles	1.0	1.0	1.0	0.0	--	0.0	--
Low Protection Level	Miles	1.0	2.0	1.0	--	1.0	--	--
Potential Trails								
Full Protection Level	Miles	2.0	2.0	2.0	2.0	3.0	3.0	3.0
Moderate Protection Level	Miles	1.0	--	1.0	1.0	--	--	--
Low Protection Level	Miles	--	1.0	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	5,119	533	1,365	6,356	6,058	7,380	7,146
Retention	Acres	277	491	171	320	341	171	405
Partial Retention	Acres	64	149	597	85	21	--	--
Modification	Acres	--	2,666		427	832	--	--
Maximum Modification	Acres	2,090	3,711	1,962	363	299	--	--
1st Decade								
Road Construction	Miles	--	3.1	2.1	2.2	0.8	0.1	0.1
Area Harvested	Acres	--	357	310	457	147	25	53
Programmed Timber Harvest	MBF	--	3,011	2,621	4,015	1,361	227	442
Area Remaining Undeveloped	%	--	85	87	81	94	99	98
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	1,792	3,178	1,706	725	832	--	--
75-94% of Full Yield	Acres	64	469	85	43	--	--	--
50-74% of Full Yield	Acres	256	43	213	235	277	149	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	64

Moose Lake - 4,778 Acres

Description

History The Moose Lake roadless area was included in RARE I, and was subsequently analyzed for potential Wilderness in the Willamette National Forest Land Management Plan (1977). The roadless area was considered for Wilderness by the United States Congress. They released the area for multiple use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 896 acres have been affected by development activities.

Location and Accesss T.13S., Rs.3 and 4E. The area lies approximately 10 miles east of Sweet Home within the Sweet Home Ranger District near Moose Ridge. Moose Lake roadless area is bordered on the north by Moose Ridge and on the south by Forest Roads 2025 and 2025720. No maintained trails access the area.

Geography and Topography This area is characterized by steep, heavily dissected sideslopes, separated by flatter lying, irregular ridges. Elevations vary from 1,300 feet at Moose Creek to 4,000 feet at the northern edge of Moose Ridge along the Forest boundary.

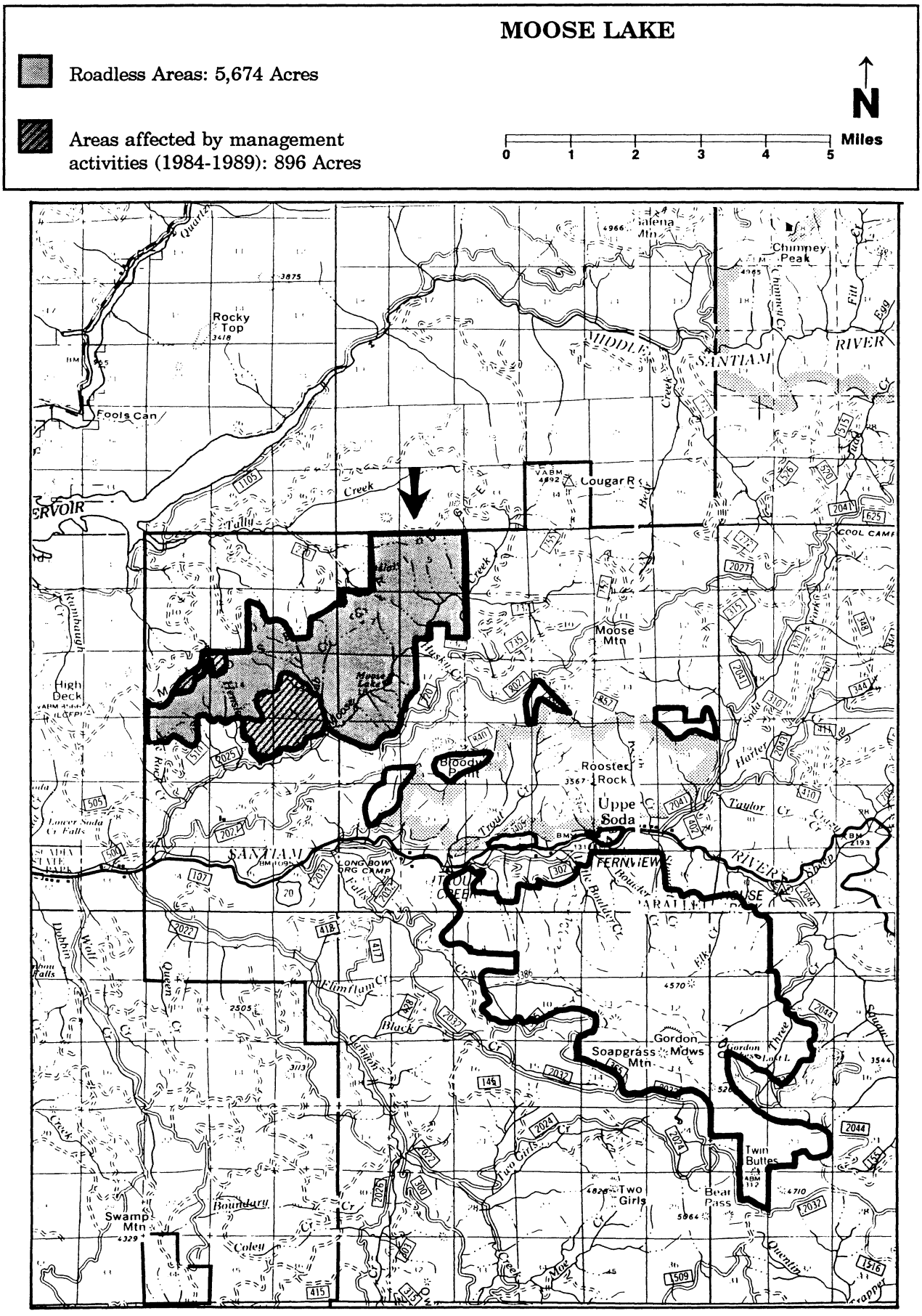
Soil Soils within the area range from less than 1 foot to over 12 feet in depth with the more shallow rocky soils on steeper slopes and deeper soils along the drainages. Soil materials consist of residuum and colluvium, developed on green and red breccias and tuffs. There are about 3,136 acres that have potential for severe surface erosion and approximately 1,813 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetation consists predominantly of Douglas-fir/western hemlock associations. The ground is covered by salal, Oregon grape, rhododendron, and smaller shade tolerant trees.

Ecosystem Type There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses At present there is little evidence of use due to the lack of access and the limited number of attractions. Due to its undeveloped state, the area is similar to Semiprimitive Nonmotorized. Recreation activities are hiking, fishing, and hunting. There are about 1,200 Recreation Visitor Days (RVDs) of use. Current management direction (FLMP 1977) is to practice multiple use management of all resources with an emphasis on

Figure C-8-1


MOOSE LAKE
Roadless Areas: 5,674 Acres
Areas affected by management activities (1984-1989): 896 Acres
N
0 1 2 3 4 5 Miles
Rocky Top
Fools Can
Chimney Peak
Middle Santiam River
Lost Creek
Lookout Mtn
Lookout Creek
Lookout Lake
Lookout Lake Trail
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sustained timber yield. Since this area was inventoried in 1984 management activities are estimated to have affected 320 acres of the area.

Appearance This area is densely forested with Douglas-fir. Moose Lake, Moose Creek, and its tributaries offer pleasant diversity to the dense timber stands.

Surroundings Roads have been developed and timber has been harvested around the perimeter of the area.

Attractions `he primary attractions are Moose Lake and Moose Creek which support a small native and anadromous fish population.

Capability

Manageability and Boundaries Boundaries generally avoid conflict with potential or existing public use and conform with terrain to constitute a barrier. Transportation access is available to the boundaries in the form of existing roads. The small size limits the ability to manage the area as Wilderness and maintain a primeval character. Sights and sounds of nonconforming uses are more apparent because of the limited distance from the core to the perimeter.

Natural Integrity Approximately 11.5 miles of unmaintained trails traverse the area. There is a helispot 1 mile northwest of Moose Lake.

Recreation use results in compaction and vegetative deterioration around Moose Lake, which is an integral feature of the area. These activities will continue as long as use occurs. Water pollution from recreation has impacted Moose Lake. Water pollution in the lake is not normally apparent to visitors and has no known effect on the natural process.

Smoke from grass field and slash burning covers virtually the entire area periodically during the spring, summer, and fall seasons but probably does not affect the natural processes. Smoke and air pollution may be apparent to the visitor from higher elevations and may affect scenic enjoyment.

Natural Appearance Most visitors find the roadless area apparently natural appearing. Evidence of unnaturalness is either absent or apparent to only the most knowledgeable visitor.

Opportunity for Solitude The Moose Lake roadless area offers a low opportunity for solitude. Diversity of topography in the form of ridges and dissected slopes offers screening potential in about half of the area, but may be limited or lacking in the remainder. Most of the roadless area has dense vegetation, which screens people from one another at short distances. There are still sufficient openings to permit travel and camping without undue concentration. The distance from the perimeter to the approximate geographic center is less than one mile; and because of this short distance, the opportunity to provide a feeling of solitude is lessened. Noise from air traffic and surrounding timber harvest operations are the most perceptible offsite intrusions. They are transitory in nature.

Opportunity for Primitive Recreation Primitive recreation opportunities are low with Moose Lake, Moose Creek, and tributaries providing the only diversity to a homogeneous Douglas-fir stand. Developments are limited to 11.5 miles of unmaintained trails.

Special Features The area generally contains fairly common features. Northern spotted owl responses have been noted, and nine cultural resources sites have also been recorded. No federally listed endangered or threatened species

Availability

Resource Potentials

Timber Resource The roadless area includes about 4,223 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir occupy the area representing about 150 million board feet. Site productivity ranges from Class II to Class V. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 611,855 cubic feet per year at culmination of the mean annual increment.

Wildlife Resource The Moose Lake roadless area includes winter range for Roosevelt elk, however, a resident deer population is the predominant user. Suitable habitat for mature old-growth timber dependent species is constrained by surrounding mixed ownerships and large areas of second growth timber. Development, to some extent, would be of benefit to big-game species if proper cover conditions and road management were maintained. Moose Creek is a steelhead nursery stream protected for an expanding population, while Moose Lake supports a resident cutthroat trout fishery.

Recreation Resource Capacity estimates indicate that this area could provide 9,115 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors throughout the area. No potential developed recreation sites have been identified.

Cultural Resource The Moose Lake roadless area has low potential for identifying the presence of cultural resources. A few lithic sites and isolated finds have been recorded in and near the area. The terrain is generally not conducive to the existence of prehistoric sites. No evidence of historic activity has been found in the area.

Management Considerations

Fire The majority of the roadless area was burned by intense wildfire around the turn of the century. From 1965 to 1985, the majority of fires have been small (less than 1 acre) lightning strikes and a few human caused fires. The average occurrence in this area is less than 1 per year. Fuel loading ranges from 30 to 130 tons per acre in old-growth stands (150 years plus) and 5 to 15 tons per acre in younger stands (80 to 150 years).

Insects and Disease Normal endemic diseases are found, and there are no documentation of past infestations of insects or disease. A potential for infestation by both the western spruce budworm and gypsy moth exists as they are presently occur in nearby forests. Scattered pockets of root rot, *Phellinus weirii*, are found throughout the area.

Need

Nearby Wilderness and Its Use Two Wildernesses are within 10 miles of the Moose Lake roadless area. These include the Middle Santiam Wilderness (8,553 acres) 10 miles to the northeast, and the Menagerie Wilderness (5,033 acres) 2 miles to the southeast. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 45 miles by road to the east of Albany, Oregon.

Interest by Proponents The Moose Lake roadless area generated a moderate amount of interest with 54% of the responses favoring inclusion of the roadless area into the roadless inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives, there will be effects on the Moose Lake roadless area. In all Alternatives except Alternative L, 75% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternative L, would alter the suitability of this area for future Wilderness consideration. Alternative L maintains the option of future Wilderness consideration for most of this area. Figure C-8-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Moose Lake roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, D, W, and J. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternative L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-8-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-8-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	4,479
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	1,045	1,045	1,045	960	1,045	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	128	128	128	128	128	85
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	171	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	107	--	85	85	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	107	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	64	--	64	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	4,714	3,370	3,413	3,391	3,349	3,370	213
15 Riparian [2]							
Management Area **15**	*	*128	*128	*128	85	128	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-8-3. Moose Lake Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	4,479
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	247	2,396	2,643	2,396	2,396	3,631	988
	Acres	64	1,301	1,365	1,301	1,344	1,408	85
Roaded Modified	RVDs	7,556	6,721	6,626	6,721	6,721	6,246	854
	Acres	4,714	3,477	3,413	3,477	3,434	3,370	213
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Moderate Protection Level	Miles	--	0.0	0.0	0.0	--	--	--
Low Protection Level	Miles	1.0	1.0	1.0	--	--	1.0	--
Visual Quality Objectives								
Preservation	Acres	--	1,173	1,173	1,173	1,088	1,173	4,565
Retention	Acres	64	--	64	--	171	--	--
Partial Retention	Acres	--	128	128	128	85	235	--
Modification	Acres	--	107	--	85	85	--	--
Maximum Modification	Acres	4,714	3,370	3,413	3,391	3,349	3,370	213
1st Decade								
Road Construction	Miles	--	2.1	4.2	4.1	3.2	4.4	0.2
Area Harvested	Acres	--	359	656	537	333	954	336
Programmed Timber Harvest	MBF	--	2,890	4,552	4,731	2,881	7,546	2,468
Area Remaining Undeveloped	%	--	77	57	65	78	39	79
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	4,181	3,136	3,114	3,156	3,093	3,136	213
75-94% of Full Yield	Acres	--	43	21	21	--	--	--
50-74% of Full Yield	Acres	43	85	128	85	--	21	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Menagerie (Rooster Rock) - 405 Acres

Description

History The Menagerie (Rooster Rock) roadless area was analyzed for potential Wilderness in the Willamette National Forest Land Management Plan (FLMP 1977). The Oregon Wilderness Act of 1984 designated 5,034 acres as Menagerie Wilderness and released 448 acres to multiple-use management in scattered parcels adjacent to the Menagerie Wilderness. Since the release of these lands in 1984, approximately 43 acres have been affected by development activities.

Location and Access T.13S., R.4E. The Menagerie roadless area is made up of several parcels scattered along the north and west boundaries of the Menagerie Wilderness and is approximately 15 miles east of Sweet Home in the Sweet Home Ranger District. Forest Road 2027 borders the west areas and Forest Road 2041 is adjacent to the eastern most area.

Geography and Topography The east area is characterized by steep dissected slopes. The west contains gentle, undulating, smooth slopes. Elevations vary from 1,600 feet near Highway 20 to 3,900 feet in the upper Keith Creek drainage.

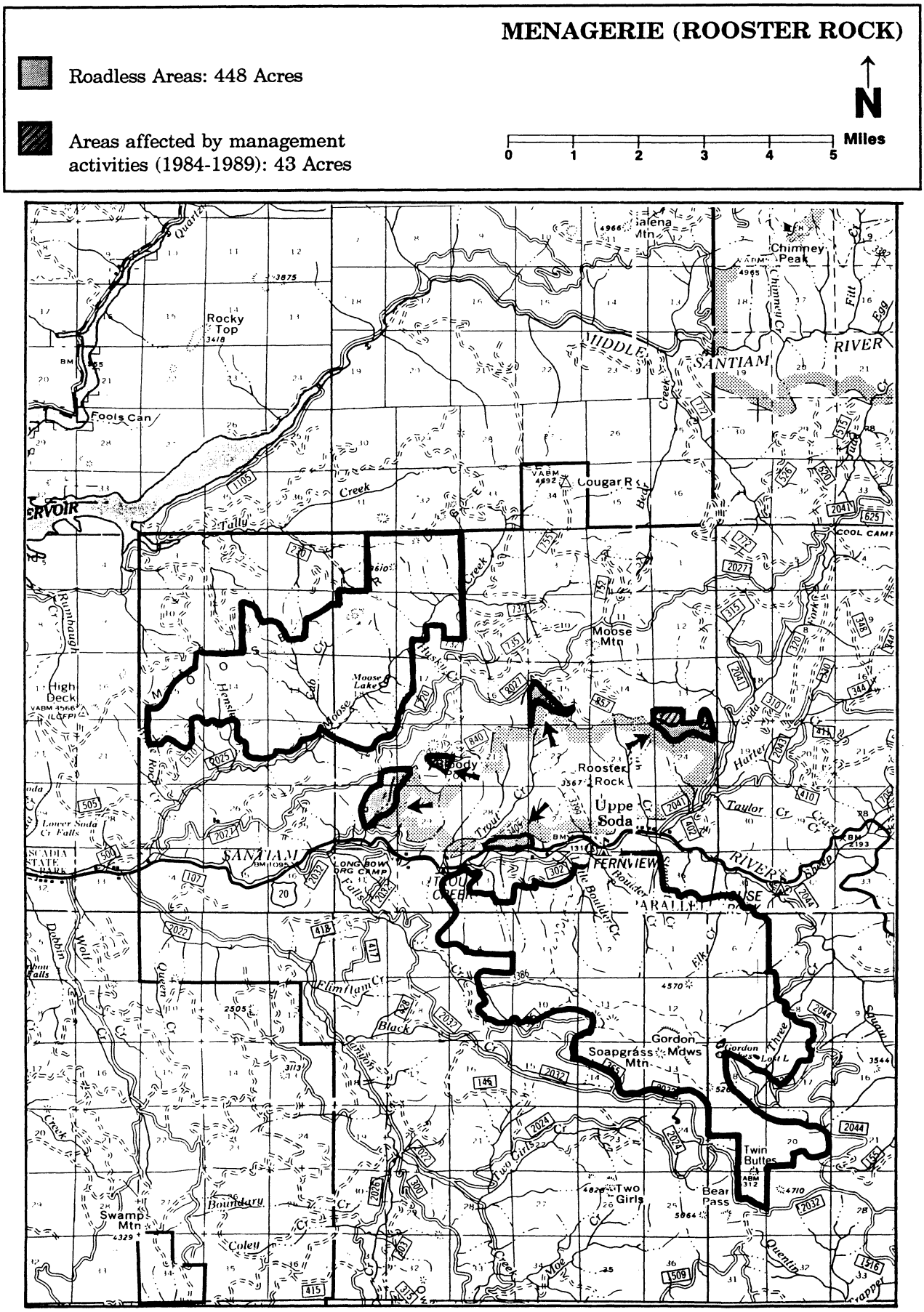
Soil Soil depths vary from less than one foot on the steep upper slopes in the east to five feet or more on the more gentle slopes in the west. Soils are generally colluvial/residual in nature, developed on breccias and tuffs. There are about 171 acres that have potential for severe surface erosion, and approximately 64 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetation consists predominantly of Douglas-fir/western hemlock associations. Both summer and winter range for big-game animals is available, though quality forage is limited to existing clearcuts adjacent to the area.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses There is little evidence of use which is limited to occasional hunters, hikers, or rock climbers. There are about 900 Recreation Visitor Days (RVDs) per year. The Recreation Opportunity Spectrum (ROS) class is Semiprimitive Nonmotorized. Current management direction (FLMP 1977) is to practice multiple use management of all resources with an emphasis on sustained timber yield. Since this area was inventoried in 1984 management activities are estimated to have affected 25 acres of the area.

Figure C-9-1


MENAGERIE (ROOSTER ROCK)
Roadless Areas: 448 Acres
Areas affected by management activities (1984-1989): 43 Acres
N
0 1 2 3 4 5 Miles
Rocky Top
Fools Can
Tally
Lougar R
Moose Mtn
High Deck
Rooster Rock
Upper Soda
Lower Soda Cr Falls
Chimney Peak
SANTIAM
RIVER
FERNVIEW
Gordon Mdws
Soapgrass Mtn
Twin Buttes
Bear Pass
Two Girls
Swamp Mtn
Boundary
Colell
Moose Lake
Trout Creek
Flimflam Cr
Taylor Cr
Harter Cr
Soda Cr
Hunt Cr
Rock Cr
Runbaugh Cr
Debbin Cr
Wolf Cr
Queen Cr
Black Cr
Elk Cr
Three Lost L
Quentin Cr

Appearance The Menagerie roadless area is densely forested with low elevation conifers. The eastern most portion contains six rock spires which are geologically unique to the Western Cascades.

Surroundings Roads have been developed and timber has been harvested around the perimeter on both private and Federal land.

Attractions The east area contains the only attraction, the rock spires, which are common to the surrounding area.

Capability

Manageability and Boundaries These areas are adjacent to the Menagerie Wilderness and offer a greater manageability for the entire area. Boundaries not abutting the Wilderness are immediately adjacent to nonconforming uses (i.e. harvest units, roads). These areas offer more opportunity for motor vehicle access and minor intrusions by people.

Natural Integrity Smoke from grass field burning and slash burning covers virtually the entire area periodically during the spring, summer, and fall seasons, but apparently does not affect natural processes.

Natural Appearance Most visitors find the roadless area natural appearing. The close proximity of roads and cutting units reduce natural appearance. Smoke and air pollution will be apparent to the visitor from higher elevations and may affect scenic enjoyment.

Opportunity for Solitude The west and east portions of the roadless area offer a moderate opportunity for solitude. Diversity of topography in the form of benches, dissected, and rolling slopes offer screening potential in at least half of the area, but may be limited or lacking in the remainder. Most of the roadless area has dense vegetation, which screens people from one another, even within a quarter of a mile; but there is still sufficient opening to permit travel and camping without undue concentration of people. The distance from the perimeter of the roadless area to the approximate geographic center of the Wilderness area is from one to two miles. Offsite intrusions include surrounding timber harvesting activities, including private land operations, and highway traffic noise (in the western most area).

Opportunity for Primitive Recreation Primitive recreation opportunities are moderate with the rock spires in the east area providing the only diversity to a homogenous Douglas-fir stand with few hazards. There are no recreation developments within any of the area boundaries.

Challenging Experiences There are opportunities for rock climbing on the spires.

Special Features The area generally contains fairly common features. One cultural resource site has been recorded in the area. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Timber Resource The roadless area includes about 363 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir occupy the area, representing about 58 million

board feet. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 51,500 cubic feet per year at culmination of the mean annual increment.

Wildlife Resource Menagerie roadless area is surrounded by large and medium size timber. The majority of the roadless area lies within winter range for big-game. Rock outcrops and steep and broken topography typify portions of the area. Habitat at lower elevations is used moderately by deer and elk during winter months. The South Santiam River is also potential osprey and bald eagle habitat. A management regime focused on developing the large segment of the second growth for late successional stands would encourage expansion of populations for such species as the spotted owl and other old- growth dependent species. Developing late successional stands would also provide dead and defective tree habitat for cavity users. Managing for early successional stands at the lower elevations could provide more usable forage for deer and elk, with proper size and location of harvest areas.

Recreation Resource Capacity estimates indicate that this area could provide 281 RVDS of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified within the area.

Minerals and Energy Resource A small parcel of this roadless area has been leased for oil and gas resources. This occurs at the northeast tip of the roadless area.

Management Considerations

Fire The majority of the unroaded area was burned by intense wildfire around the turn of the century. From 1965 to 1985 the majority of fires in the area have been small (less than 1 acre) lightning strikes and a few human caused fires (campfires, etc). The average occurrence in this area is less than 1 per year. Fuel loading in the area ranges from 30 to 130 tons per acre in old-growth stands (150 years plus) and 10 to 40 tons per acre in younger stands (80 to 150 years).

Insects and Disease Only normal endemic diseases are found in the area with no documentation of past infestations of insects or diseases. A potential for infestation by both the western spruce budworm and gypsy moth exists, as they presently occur in nearby forests. Scattered pockets of root rot, *Phellinus weirii*, are found throughout the area.

Need

Nearby Wilderness and Its Use Two Wildernesses are within 10 miles of the Menagerie roadless area. These include the Middle Santiam Wilderness (8,553 acres) 10 miles to the northeast and the Menagerie Wilderness (5,033 acres) adjacent with common boundaries. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 45 miles by road to the east of Albany, Oregon.

Interest by Proponents The Menagerie roadless area generated a high amount of interest with 71% of the responses favoring inclusion of the roadless area into the roadless inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives, there will be effects on the Menagerie roadless area. In all Alternatives 68 to 95% of this area will be affected by road construction timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive

recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Menagerie Wilderness would remain suitable for consideration as Wilderness in the next cycle of Forest planning. Figure C-9-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Menagerie roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-9-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-9-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	64
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	43
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	213	--	171	171	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	21	21	213	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	43	43	43	64	64	43	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	363	128	341	128	128	128	277
15 Riparian [2]							
Management Area **15**	*	*21	*21	*21	21	21	21

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-9-3. Menagerie (Rooster Rock) Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	43
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	494	741	741	1,235	1,235	173	988
	Acres	43	64	64	107	107	277	85
Roaded Modified	RVDs	1,386	1,291	1,291	1,101	1,101	3,325	1,196
	Acres	363	341	341	299	299	128	277
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	--	--	--	43
Retention	Acres	43	43	43	64	64	64	--
Partial Retention	Acres	--	21	21	43	43	235	85
Modification	Acres	--	213	--	171	171	--	--
Maximum Modification	Acres	363	128	341	128	128	128	277
1st Decade								
Road Construction	Miles	--	0.5	1.0	0.5	0.4	0.5	0.2
Area Harvested	Acres	--	39	73	59	36	113	471
Programmed Timber Harvest	MBF	--	314	503	523	310	893	3,455
Area Remaining Undeveloped	%	--	69	42	54	72	14	100
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	320	299	299	277	277	299	235
75-94% of Full Yield	Acres	--	21	21	21	--	--	--
50-74% of Full Yield	Acres	43	43	43	64	64	64	64
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Gordon Meadows - 8,361 Acres

Description

History The Gordon Meadows roadless area was analyzed for potential Wilderness in the Willamette National Forest Land Management Plan (1977). The Oregon Wilderness Act of 1984 released all 9,556 acres to multiple-use management. Since the release of these lands in 1984, approximately 1,195 acres have been affected by development activities.

Location and Access Tps.13 and 14S., Rs.4 and 5E. The Gordon Meadows roadless area is within the Sweet Home Ranger District approximately 16 miles east of Sweet Home. The area is south of U.S. Highway 20, bordered on the south by several local Forest Roads that are tributary to Forest Road 2032, and bordered on the east by Road 2044. Forest Trail 3386 to Gordon Meadows provides additional access.

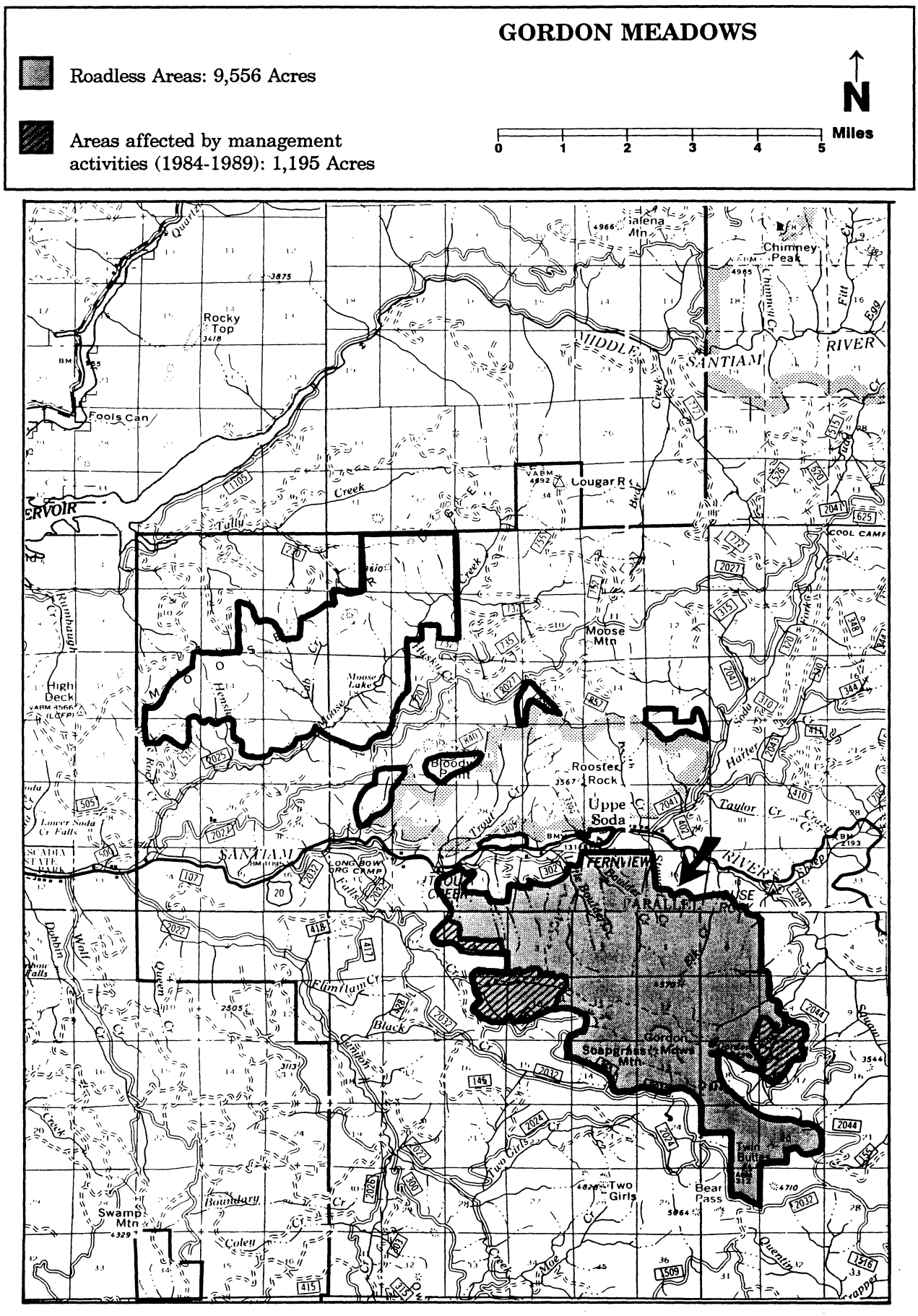
Geography and Topography This area is characterized by a variety of terrain. The southern portion is comprised mainly of upland benches and flats with ponds and numerous wet areas. These flatter, smooth slopes extend east and west throughout the area. The remaining lands to the north are typically steep to very steep, highly dissected slopes of the Western Cascades that terminate upslope in rock outcroppings and an impressive escarpment. Elevations range between 1,600 feet at Lower Boulder Creek and 5,300 feet along Twin Butte Ridge.

Soil Soils on the steep, dissected scarps are made up primarily of colluvial/residual material and range from 2 to 10 feet deep. The flatter upland benches soils are glacial in origin and vary between 6 and 12 feet. There are about 4,586 acres that have potential for severe surface erosion and approximately 683 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Plant associations in the lower elevations are in the western hemlock climax zone and in the higher elevations are in the Pacific silver fir zone. However, there is a high diversity of plant life within the area. Gordon Lakes and the nearby wet meadows with there surrounding stands of very old trees are a testimony to its protection from fire. Many of the forest's ecological characteristics such as tree height and diameter, stand volume, spatial volume, structural diversity, species diversity, wildlife habitat value, fire resistance, nutrient cycling, and organic matter are a result of trees living past 200 years of age.

Ecosystem Type There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-10-1


GORDON MEADOWS
Roadless Areas: 9,556 Acres
Areas affected by management activities (1984-1989): 1,195 Acres
N
0 1 2 3 4 5 Miles
Rocky Top
Fools Can
Tully Creek
Lougar R
Chimney Peak
SANTIAM RIVER
Moose Mtn
Rooster Rock
Upper Soda
FERNVIEW
Swamp Mtn
Two Girls
Bear Pass
Boundary
Colell
Black
Flumlam Ct
Taylor Cr
Harter
Trout
Rumbaugh
High Deck
Lower Soda Cr Falls
Dobbin Falls
Wolf
Quartz
Fitt
Egg
Chimney Cr
Middle Creek
Moose Lake
Bloody Point
Soda Cr
Parallel Rock
Gordon
Snapdragon Mtn
Meadow
Quentin
Trapper
Swamp Mtn
Cool Camp

Current Uses At present there is little evidence of use partly due to the lack of access and partially because of the limited number of attractions. The Recreation Opportunity Spectrum (ROS) class for the area is Semiprimitive Nonmotorized based on lack of development. Activities such as fishing, hunting, hiking, and dispersed camping attract 9,100 Recreation Visitor Days (RVDs) annually. Current management direction to practice multiple-use management of all resources with an emphasis on sustained timber yield. Since this area was inventoried in 1984 management activities are estimated to have affected 136 acres of the area.

Appearances This area is densely forested with Douglas-fir and western hemlock at the lower elevations which gradually mixes of true fir as elevation increases. On the upland flats, Gordon Meadows and Gordon Lakes offer a pleasant diversity to the dense stand of trees. The meadows open to silhouetted views of the mountains on the crest of the Cascade Range.

Surroundings Roads have been developed and timber has been harvested around the perimeter of the area. U.S. Highway 20 parallels relatively close to the north boundary of the unroaded area.

Attractions The primary attractions are Gordon Lakes and Gordon Meadows areas and the very old trees of the Three Creeks drainage.

Capability

Manageability and Boundaries Boundaries generally avoid conflict with potential or existing public use and conform with terrain. Transportation access is available to the boundaries in the form of existing roads. The small size somewhat limits the ability to manage the roadless area and maintain a primeval character. Boundaries tend to be located adjacent to nonconforming uses rather than shielding terrain features.

Natural Integrity Special recreation facilities include Gordon Meadows shelter at Gordon Meadows and Twin Buttes lookout at Twin Buttes. The shelter and the lookout are no longer maintained and have collapsed and are in the process of deteriorating. The Gordon Lakes Trail, totaling 10.5 miles, traverses the Gordon Meadows roadless area. Present trails do not measurably alter the natural processes.

Recreation and range allotment use have resulted in compaction and vegetative deterioration at Gordon Lakes.

A 50 cow/calf range permit on Gordon Meadows results in trampling and grazing of meadow vegetation.

Water pollution from recreational use and cattle has had a small amount of effect on Gordon Lakes and Falls Creek. The source of pollution cannot be corrected without elimination of visitors and cattle. Water pollution is not normally apparent to visitors and has little known effect on natural processes.

Other fixed site facilities in the area are helispots one mile east of Gordon Meadows and at Soapgrass Mountain.

Transitory smoke from grass field and slash burning covers virtually the entire area periodically during the spring, summer, and fall seasons; but apparently does not affect the natural process.

Natural Appearance Most visitors find the roadless area apparently natural with physical developments separated. Smoke and air pollution will be apparent to the visitor from higher elevations and will affect scenic enjoyment. Visibility of cattle and their droppings will affect the appearance of naturalness.

Opportunity for Solitude The Gordon Meadows roadless area offers a moderate opportunity for solitude. Diversity of topography in the form of benches and dissected slopes offer screening potential in at least half of the area, but may be limited or lacking in the remainder. Most of the roadless area has dense vegetation, which screens people from one another, even within a quarter of a mile, but there is still sufficient opening to permit travel and camping without undue concentration. The distance from the perimeter to the approximate geographic center is from one to two miles. Offsite intrusions are noise from airplanes, highway traffic, and surrounding timber harvesting. Highway traffic may be considered a permanent intrusion while the other intrusions would be considered transitory.

Opportunity for Primitive Recreation Primitive recreation opportunities are moderate with Gordon Lakes and Gordon Meadows providing the only diversity to the continuous forest canopy. Developments are limited to trails maintained to a low standard and the collapsed shelter and lookout. Gordon Lakes offer fishing and dispersed camping opportunities.

Special Features Some of the super old-growth stands are over 700 years old. Cultural resources have been recorded on fifteen sites; and no federally listed endangered or threatened species are known to be present.

The super old-growth stands offer a unique opportunity to study succession, ecosystem development, fire history, soil development, and soil microorganisms among other subjects. These stands near the upper age limit will exhibit more fully developed traits. Some processes such as wood decomposition and soil formation may depend on long-term cycles which are only evident in the oldest ages of stands.

Availability

Resource Potentials

Water Resource Approximately 0.3 mile of penstock for the Falls Creek Hydroelectric project runs along the northwest boundary.

Timber Resource The roadless area includes about 5,695 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir occupy the area, representing about 204 million board feet. Site productivity ranges from Class III to Class V. The remaining area is unsuitable. If stands are converted to a managed condition, biological potential yield will be 758,700 cubic feet per year at culmination of mean annual increment.

Livestock Resource A 50 cow/calf allotment exists for the Gordon Meadows area. There is no potential to increase this use.

Wildlife Resource The Gordon Meadows roadless area occupies high site summer range for deer and elk and critical winter range along its northern margin. Use on winter range is restricted by adverse topography, aspect, and lack of early successional stages. Harvesting would probably benefit big-game species if balanced through time with proper size and distribution of units. The Gordon Meadows complex is currently a grazing allotment supporting approximately 150 Animal Unit Months (AUMs). A management regime focused on developing the large segment of second growth timber for late successional stands would probably encourage expansion of populations of such species as the spotted owl. Fisheries include brook trout in Black Creek and resident cutthroat trout and rainbow trout in Gordon Lakes.

Recreation Resource Capacity estimates indicate that this area could provide 5,383 RVDs of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. No potential developed recreation sites have been identified.

Cultural Resource Prehistoric sites have been recorded along the southwest portion of the roadless area. The terrain has broad flats ridges and meadows. Most of the land in the northeast portion is too steep to have much potential for locating artifacts and sites.

Management Considerations

Fire The majority of the Gordon Meadows roadless area was burned by intense wildfire around the turn of the century. From 1965 to 1985, the majority of fires have been small (less than 1 acre) lightning strikes and a few human caused fires. The average occurrence is less than 1 per year. Fuel loading ranges from 30 to 130 tons per acre in older stands (150 years plus) and 10 to 40 tons per acre in younger stands (80 to 150 years).

Insects and Disease Only common endemic diseases are found in the area; there is no documentation of past infestations of insects or diseases. A potential for infestation by both the western spruce budworm and gypsy moth exists, as they presently occur in nearby forests. Scattered pockets of root rot, *Phellinus weirii*, are found throughout the area.

Need

Nearby Wilderness and Its Use The Menagerie Wilderness (5,033 acres) is just north of U.S. Highway 20 (less than a quarter of a mile). Refer to Chapter III for the amount of use this Wildernesses receives.

Distance from Population Centers The area is approximately 50 miles by road to the east of Albany, Oregon.

Interest by Proponents The Gordon Meadows roadless area generated a moderate amount of interest with 55% of the responses favoring inclusion of the roadless area into the roadless inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Gordon Meadows roadless area. In Alternatives NC, K, A, J, and W, 56 to 93% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with Alternative K would alter the suitability of this area for future Wilderness consideration. Alternatives L and D maintain the option of future Wilderness consideration for most of this area. The opportunity for future consideration of the undeveloped areas for inclusion in the National Wilderness Preservation System will be forgone due to the effects on the size of the area from the management activities. Figure C-10-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Gordon Meadows roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated

in Figure C-10-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-10-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	7,721
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	661	725	21	85
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	405
7 Old-Growth Grove							
Management Area **7**	--	--	--	384	683	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	64	64	64	64	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	64	128	64	--	--	--
Management Area **9d**	--	256	--	256	341	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	2,453	--	2,346	960	--	--	--
Management Area **10e**	--	--	--	1,237	1,792	7,977	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	5,695	--	4,031	4,117	64	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	277	384	149	--
Management Area **11d**	--	--	--	85	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	64	171	64	299	171	128	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	5,844	1,941	5,610	--	--	--	64
15 Riparian [2]							
Management Area **15**	*	*169	*149	*42	85	21	85

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-10-3. Gordon Meadows Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	7,721
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	1,504	--	1,407	1,831	1,572	4,224	--
	Acres	2,453	--	2,346	2,858	2,517	7,977	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	494	5,779	3,655	10,669	12,447	741	4,693
	Acres	64	725	405	1,472	1,728	320	576
Roaded Modified	RVDs	10,802	14,864	9,947	5,505	5,790	285	190
	Acres	5,844	7,636	5,610	4,031	4,117	64	64
Trails								
Existing Trails								
Full Protection Level	Miles	7.0	7.0	7.0	10.0	8.0	14.0	14.0
Moderate Protection Level	Miles	1.0	0.0	1.0	0.0	--	--	0.0
Low Protection Level	Miles	6.0	7.0	6.0	4.0	6.0	0.0	--
Potential Trails								
Full Protection Level	Miles	--	0.0	--	2.0	3.0	3.0	2.0
Moderate Protection Level	Miles	0.0	0.0	1.0	1.0	--	--	1.0
Low Protection Level	Miles	2.0	2.0	2.0	0.0	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	128	192	2,410	3,263	7,999	7,807
Retention	Acres	2,517	427	2,410	1,514	512	128	--
Partial Retention	Acres	--	171	149	405	469	171	491
Modification	Acres	--	5,695	--	--	--	64	--
Maximum Modification	Acres	5,844	1,941	5,610	4,031	4,117		64
1st Decade								
Road Construction	Miles	--	4.3	6.1	4.1	4.0	0.5	0.4
Area Harvested	Acres	--	604	1,117	730	438	106	740
Programmed Timber Harvest	MBF	--	4,824	7,665	6,430	3,763	841	5,430
Area Remaining Undeveloped	%	--	78	59	73	84	96	73
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	4,949	5,098	4,735	3,840	3,946	213	43
75-94% of Full Yield	Acres	149	128	171	128	43	--	--
50-74% of Full Yield	Acres	597	277	683	533	149	128	427
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Mt. Washington North - 1,003 Acres

Description

History There were 1,706 acres contiguous to the Mt. Washington Wilderness in the roadless area inventory. The Oregon Wilderness Act of 1984 designated 576 acres out of these to be Wilderness. The remaining 1,130 acres, referred to as Mt. Washington North roadless area, have been released for multiple-use management. Since the release of these lands in 1984, approximately 127 acres have been affected by development activities.

Location and Access T.14S., R.7½ E., Sec. 9, 10, and 11. The area is located contiguous to the central northern boundary of Mt. Washington Wilderness, immediately southwest of Big Lake in the Santiam Pass area. It is accessed from U.S. Highway 20 and Big Lake Road (Forest Road 2690). Patjens Lake Trail 3397 and Pocket Way Trail 3522 traverse the area. It is approximately 40 miles northwest Bend, Oregon.

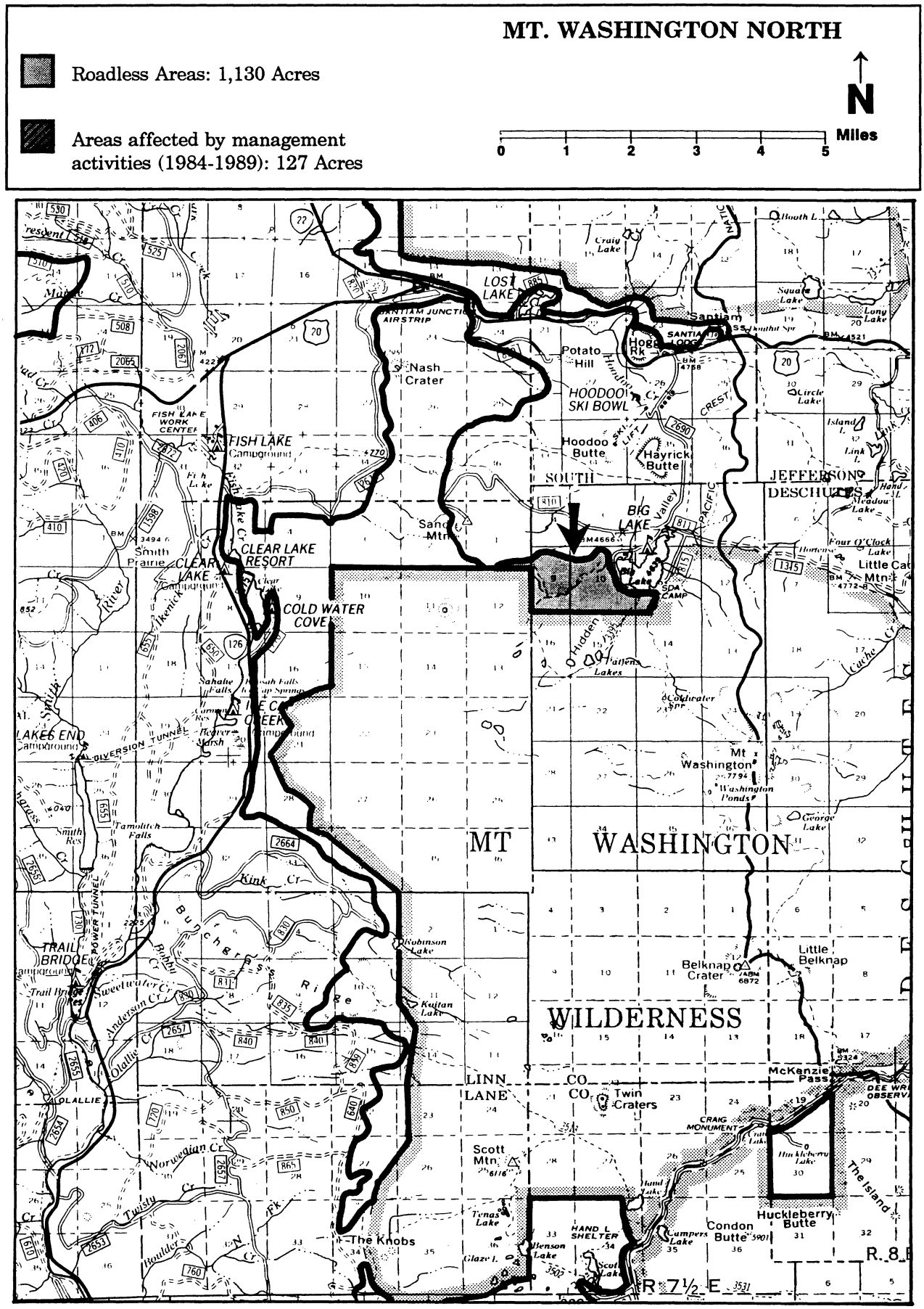
Geography and Topography The area is situated within the High Cascade Physiographic Province. It is characterized by rolling gentle terrain common to the lands immediately west of the crest of the Cascade Range. The northern half is relatively flat; the topography is gentle with a northwest aspect. The southern half is situated on the north side of a northeast to southwest ridge which separates the Patjens Lakes Basin from Santiam Pass.

Soil Sands and cinders, with a scattering of rock outcrops, generally low fertility, short growing seasons, and cold temperatures are characteristic of this area. There are about 21 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation A mixed stand of lodgepole pine, mountain hemlock, Pacific silver fir and noble fir covers virtually the entire area.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock (*Abies-Tsuga*) forest (004).

Figure C-11-1


MT. WASHINGTON NORTH
Roadless Areas: 1,130 Acres
Areas affected by management activities (1984-1989): 127 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
MT WASHINGTON
LINN CO
LANE CO
JEFFERSON CO
DESCHUTES CO
Mt Washington 7794
Belknap Crater
Little Belknap
Scott Mtn.
Twin Craters
McKenzie Pass
Potato Hill
Hoodoo Butte
Hayrick Butte
HOODOO SKI BOWL
Nash Crater
Sand Mtn.
Santiam Junction
Santiam Lodge
LOST LAKE
FISH LAKE Campground
FISH LAKE WORK CENTER
CLEAR LAKE RESORT
CLEAR LAKE Campground
COLD WATER COVE
BIG LAKE
SDA CAMP
Hidden Lakes
Coldwater Spr.
LAKES END Campground
DIVERSION TUNNEL
POWER TUNNEL
TRAIL BRIDGE
Trail Bridge Campground
Tamolitch Falls
Smith Res.
Robinson Lake
Kujtan Lake
Scott Mtn.
Tenas Lake
Glaze L.
Benson Lake
HAND L SHELTER
Campers Lake
Condon Butte
Huckleberry Butte
The Knobs
CRAIG MONUMENT
Four O'Clock Lake
Little Cat Mtn.
Circle Lake
Squaw Lake
Long Lake
Island L.
Link L.
Meadow Lake
George Lake
Washington Ponds
Coldwater Spr.
Booth L.
Craig Lake
Huckleberry Lake
Hand L.
Cache Cr.
Kink Cr.
Norwegian Cr.
Twisty Cr.
Boulder Cr.
Olallie Cr.
Anderson Cr.
Sweetwater Cr.
Butcherknife Ridge
Smith River
Varuna Cr.
Ikenick Cr.
Fish Lake Cr.
Hoodoo Cr.
Marion Cr.
Pacific Crest Trail
R. 7½ E
R. 8

Current Uses The area is identified in the 1977 Forest Land Management Plan as Dispersed Motorized Recreation/Timber allocation. Management activities to date focus on maintenance of the two trails which traverse the area. No motorized use is permitted on the trails and dense vegetation precludes Off-Road Vehicles (ORV) or other motorized users from using the area. The vast majority of use is hiking on the Patjens Lake Trail to Patjens Lake. Use is estimated to be less than 500 Recreation Visitor Days (RVDs) per year.

Appearance The area is fairly flat and dominated by a forested ridge in its southern half. The vegetation is fairly dense and continuous, with occasional small openings. Openings, in some cases, are meadows which dry up by mid to late summer. At the highest points on the ridge there are a couple of talus slopes and a few rock outcrops. The area is exceedingly similar to lands which border it to the west, south, and east.

Surroundings The area is bordered on the south by the Mt. Washington Wilderness. The Mt. Washington Wilderness is dominated by Mt. Washington and several hundred square miles of recent lava flows. The Wilderness has lightly concentrated use at a few lakes near its edges. To the east, north, and west, lies the Santiam Pass Winter Recreation Area, dominated by Big Lake and the Airstrip Burn. Intense year-round recreation activity occurs here, ranging from snowmobiling and nordic skiing in the winter, to ORV use, hiking, camping, and waterskiing at Big Lake in the summer. Intensive timber stand improvement activities have taken place in the burned area of the Airstrip Fire of 1967.

Attractions Patjens Lake Trail and Pocket Way are the main attractions.

Capability

Manageability and Boundaries The boundaries would be easily managed.

Natural Integrity Without the intervention of people, the area would probably have burned during the Airstrip Fire in 1967.

Natural Appearance Most visitors find the area apparently natural. Unnaturalness is evident only to the more knowledgeable visitors.

Opportunity for Solitude Rolling terrain and limited diversity of topography offers some screening potential while dense vegetation does screens people from one another, even within a quarter mile. There are still sufficient openings to permit travel and camping without undue concentration. The distance from the perimeter to the core of the contiguous Mt. Washington Wilderness is approximately 4 miles. Offsite intrusions are close by and permanent. Powerboats on Big Lake in the summer and snowmobiles and three wheelers in the winter can be heard from within the area.

Opportunity for Primitive Recreation The area is dominated by forested, rolling terrain, and contains no lakes or streams.

Special Features The area contains only common features; no cultural features or federally listed endangered or threatened species are known to be present.

Availability

Resource Potential

Wildlife Resource This Mt. Washington North roadless area is used by mule deer as summer range and by other animal species that are endemic to the area, such as pika, Clark's nutcracker, marten, etc. The management of the area for late successional stages would maintain the necessary cover required by big-game and other species.

Recreation Resource Capacity estimates indicate that this area could provide 1,828 RVDs of Semiprimitive recreation use. Potential trail locations and developed recreation sites have been identified.

Timber Resource The roadless area includes about 768 acres of land suitable for growing timber under managed conditions. Stands of mature lodgepole pine, true firs, and mountain hemlock occupy the area representing about 14 million board feet. If stands are converted to a managed condition, biological potential yield will be 60,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resource Given the presence of Big Lake along the northern edge of the area, it is likely that prehistoric sites are present.

Mineral and Energy Resource There is a geothermal lease covering the entire roadless area. Potential is low for development of geothermal resources.

Management Considerations

Fire Catastrophic fire frequency is 250-600 years. No recent known fire activity has occurred.

Need

Nearby Wilderness and Its Use The Mt. Washington Wilderness (56,202 acres) is adjacent to the southern boundary, and the Mt Jefferson Wilderness (105,299 acres) is 5 miles north. To the south 15 miles is the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 85 miles by road to the east of Albany Oregon, 85 miles northeast of Eugene, and 40 miles northwest of Bend, Oregon.

Interest by Proponents The Mt. Washington North roadless area generated a low amount of interest with 78 % of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Mt. Washington North roadless area. In Alternatives NC and A, 4% of this area will be affected by development. Alternative L will develop 8% of the area and Alternatives K, J, W, and D will develop 2% of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Portions of this area contiguous to the Mt. Washington Wilderness would remain suitable for consideration as Wilderness additions in

the next cycle of Forest planning. All Alternatives maintain the option of future Wilderness consideration for this area. Figure C-11-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Mt. Washington North roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-11-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-11-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	917
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	960	853	960	789	768	--	--
Management Area **10c**	--	--	--	--	--	981	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	128	--	192	192	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	21
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	--	--	--	21	--	43
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	21	21	21	21	21	21	21
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	21	--	21	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-11-3. Mt. Washington North Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	917
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	2,265	2,400	2,665	2,205	2,179	2,729	--
	Acres	960	853	960	789	768	981	--
Roaded Natural	RVDs	247	1,507	247	2,248	2,347	247	840
	Acres	21	149	21	213	235	21	85
Roaded Modified	RVDs	95	--	95	--	--	--	--
	Acres	21	--	21	--	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	2.0	1.0	2.0	3.0	4.0	4.0
Moderate Protection Level	Miles	3.0	2.0	3.0	2.0	1.0	--	0.0
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	--	--	--	917
Retention	Acres	--	128	--	192	213	981	43
Partial Retention	Acres	981	875	981	81	789	21	43
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	21	--	21	--	--	--	--
1st Decade								
Road Construction	Miles	--	0.5	1.0	1.0	0.7	--	0.0
Area Harvested	Acres	--	23	41	105	65	--	--
Programmed Timber Harvest	MBF	--	198	313	875	564	--	31
Area Remaining Undeveloped	%	--	92	86	67	80	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	21	--	21	--	299	--	21
75-94% of Full Yield	Acres	747	683	747	619	555	--	--
50-74% of Full Yield	Acres	--	--	--	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	21

Mt. Washington West - 6,676 Acres

Description

History The Mt. Washington West roadless area was considered for Wilderness by the United States Congress. They released the area for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 3,050 acres have been affected by development activities.

Location and Access Tps.13, 14, and 15S., R.7E. The area is primarily a narrow strip which borders the western and northwestern boundary of the Mt. Washington Wilderness. The northern most portion covers the neck of land between Forest Road 2676 (Eno Road) and Potato Hill, and is bordered on the north by U.S. Highway 20. It is approximately 75 miles east and slightly north of Eugene, Oregon. Access is by Clear Lake Highway or U.S. Highway 20 to Forest Roads 2664, 2676, 2657, and 2653.

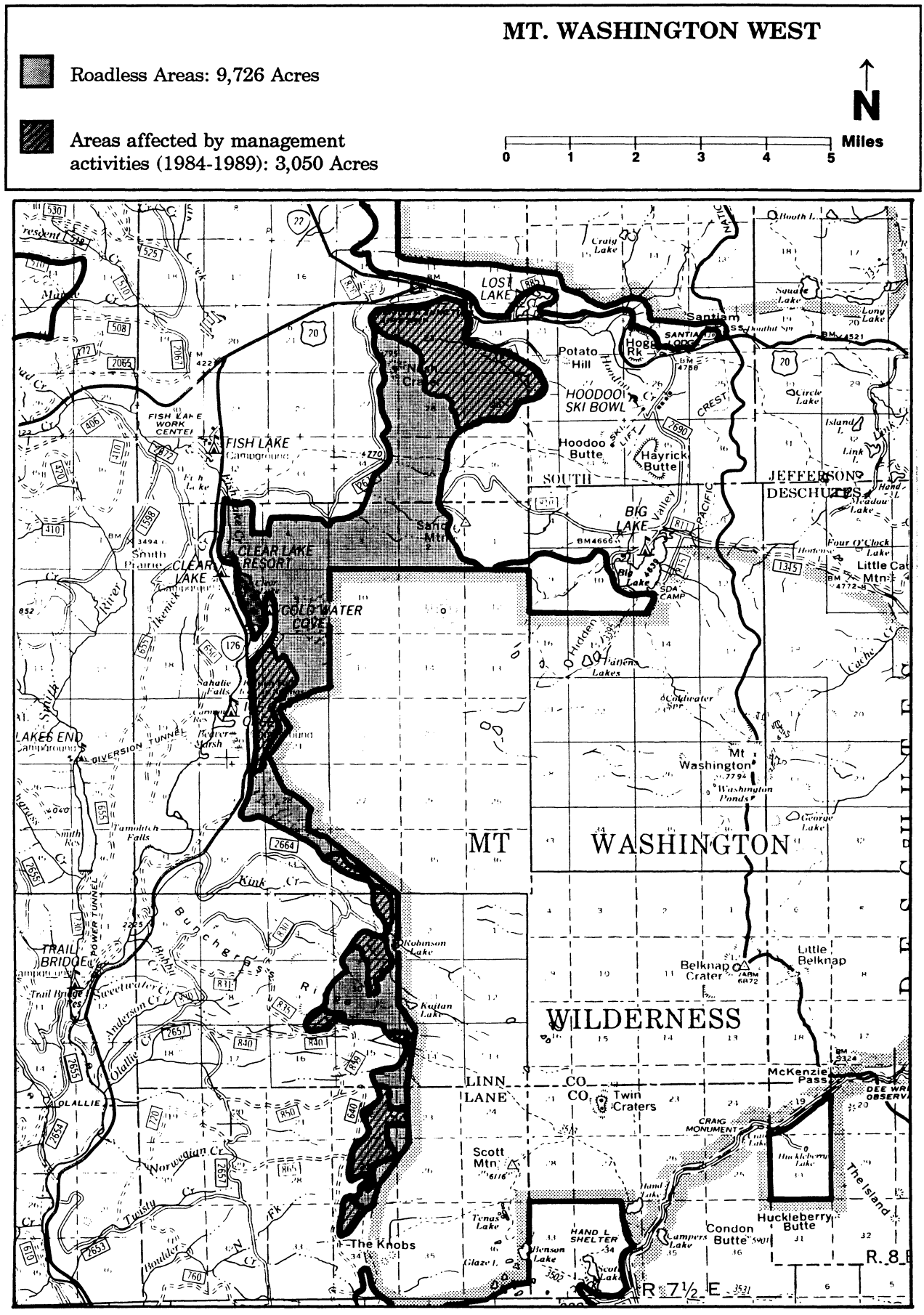
Geography The area is situated within the High Cascades Physiographic Province and is characterized by gentle terrain and recent lava flows common to the lands immediately west of the High Cascade Crest.

Topography The northern portion is predominantly rolling terrain and contains Nash Crater, the western flanks of Sand Mountain, and other small cinder cones. The central portion is also relatively gentle and rolling with the marked exception of a narrow tongue of the Belknap Lava Flow passing through it. The southern portion is rolling and gentle. Elevations range from 3,000 feet near Clear Lake to 5,200 feet at Sand Mountain, with the bulk ranging from 4,000 feet to 4,800 feet.

Soil Soils in the northern portion are markedly different from those in the southern portion. The soils in the northern portion are predominantly sands and cinders; approximately 30% of the area is lava. The southern portion is approximately 60% landtype 66, 15% landtype 67, and the remaining 25% is a mixture of landtypes 6, 64, and 610. There are about 619 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The vegetative cover is primarily a mixed stand of lodgepole pine, mountain hemlock, Pacific silver fir, and noble fir. Approximately 20% of the vegetated land is covered by Douglas-fir.

Figure C-12-1


MT. WASHINGTON WEST
Roadless Areas: 9,726 Acres
Areas affected by management activities (1984-1989): 3,050 Acres
N
0 1 2 3 4 5 Miles
MT WASHINGTON WILDERNESS
LOST LAKE
HOODOO SKI BOWL
Hoodoo Butte
Hayrick Butte
Potato Hill
Hogg Rk
Santiam Pass
FISH LAKE
FISH LAKE WORK CENTER
CLEAR LAKE RESORT
CLEAR LAKE
COLD WATER COVE
BIG LAKE
SOUTH JEFFERSON DESCHUTES
Mt Washington
Belknap Crater
Little Belknap
McKenzie Pass
Twin Craters
Scott Mtn
The Knobs
Condon Butte
Huckleberry Butte
The Island
LAKES END
TRAIL BRIDGE
DIVERSION TUNNEL
POWER TUNNEL
Buchanan Ri
Kink Cr
Norwegian Cr
Twisty Cr
Boulder Cr
Anderson Cr
Ollallie Cr
Hidden Lakes
Robinson Lake
Kutan Lake
Tenas Lake
Ulman Lake
Glaze L
Hand Lake
Lampers Lake
Huckleberry Lake
Four O'Clock Lake
George Lake
Washington Ponds
Calibrater Spr
Tamolitch Falls
Sahalie Falls
HAND L SHELTER
CRAIG MONUMENT
LINN CO
LANE CO
R. 7½ E
R. 8

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock *(Abies-Tsuga)* forest (004) and Pacific silver fir/Douglas-fir *(Abies-Pseudotsuga)* forest (003).

Current Uses The northern portion is identified in the 1977 Forest Land Management Plan (FLMP 1977) as part of the Santiam Pass Motorized Recreation/Timber allocation. The Recreation Opportunity Spectrum (ROS) class is Semiprimitive Motorized. This part of the area has several different uses occurring, including active harvesting and road building, Off-Road Vehicle (ORV) use along the Santiam Wagon Road, nordic skiing and snowmobile use on the Spud Timber Sale roads during the winter months, and hiking and backpacking on Deer Butte and Hand Lake trails. The southern portion is classified in the General Forest allocation (FLMP 1977) and has two active timber sales, Muskego and Mutton, occurring within its boundaries. Hiking and some backpacking occurs along portions of the Deer Butte Trail and a short piece of the Benson Trail. Along a strip on the western-most edge situated roughly east and south of Clear Lake, one sliver of land is classified Scenic I and another is classified Scenic II. This portion borders Clear Lake Highway, Coldwater Cove Campground, and Clear Lake; virtually no activities take place here. Since this area was inventoried in 1984 management activities are estimated to have affected 2,560 acres of the area.

Appearance The area for the most part is gentile landforms with some scattered small cinder cones which rise 500 to 700 feet above the surrounding area. The northern portion is typically a mixed stand of western white pine, western hemlock, and Douglas-fir with very few openings. There are some scattered small rock bluffs and several open cinder slopes on the sides of some of the cinder cones. The central portion has a mix of Douglas-fir and western hemlock stands which are broken up by several lava flows. The lava flows are dotted with scattered trees and are rough and jagged. The southern portion is characterized by continuous stands of mature trees, mostly Douglas-fir. Those portions not affected by trails, harvesting, and road building are in pristine condition.

Surroundings The northern half is part of the Santiam Pass Winter Recreation Area. Located immediately east of this portion lies Hoodoo Ski Bowl, with several winter parking areas and 40 miles of winter ski and snowmobile trails. These facilities are the backbone of the winter sports program for the Santiam Pass area. The Santiam Pass also experiences high levels of recreation use in the other seasons, especially in the summer months from ORV users and woodcutters. To the west, along Eno Road, some harvest activities took place in the early 1970s. Further south and to the west lies McKenzie River National Recreation Trail, Clear Lake, Clear Lake Resort, and Coldwater Cove Campground. This area is intensively managed for developed recreation opportunities. The southern portion is bordered to the west by a large block of relatively flat ground which is intensively managed for timber production. East of most of the area is the Mt. Washington Wilderness. The Wilderness is lightly used along this border; some small amounts of hiking, fishing, and backpacking take place.

Attractions Nash Crater, Belknap Lava Flow, and Hand Lake Trail are of particular importance.

Capability

Manageability and Boundaries Several recent timber harvest and road building activities will require the adjustment of this area's original boundary. To make the area more manageable, it is recommended the northern boundary be changed along the south side of the Santiam Wagon Road, and the central and southern portions' be adjusted to exclude harvest activities on the Muskego and Mutton Timber Sales.

Natural Integrity Timber harvest units and roads are present, which affect only a small portion of the total area.

Natural Appearance Aside from timber harvest areas, the rest appears natural to all but the most knowledgeable.

Opportunity for Solitude Rolling type terrain and limited diversity of topography offers limited screening potential. Dense vegetation would provide good screening but there are enough openings to prevent undue concentration of camping spots. Most of the area is in close proximity to roads and vehicle noise along Clear Lake Highway and U.S. Highway 20 can be heard.

Opportunity for Primitive Recreation The Mt. Washington West roadless area offers limited diversity; with the exception of lava flows, the Forest, for the most part, is dense and homogeneous. There is no water, no recreational facilities, and few trails. Occasional views can be afforded to the cross-country traveller from some of the cinder cones and rock bluffs.

Challenging Experiences There are boulder-scrambling possibilities in the lava flows.

Special Features No federally listed endangered or threatened species known to be present. The Santiam Wagon Road remnants still remain as a cultural resource interest.

Availability

Resource Potential

Wildlife Resource This roadless area actually consists of two different habitat types that influence the wildlife use and management potential. The portion north of Beaver Marsh consists of bare lava flows, lava forests, or volcanic influenced forest systems. This area receives moderate use from big-game (30 elk) and could benefit from management for early successional stages. The southern half consists of dense west side forest systems and receives more extensive use by big-game, spotted owls and mature timber dependent species. Big-game forage in the adjacent roaded clearcuts and use the roadless area for calving and rearing young. Managing this area for later successional stages would provide thermal cover and habitat for big-game and old-growth dependent species.

Recreation Resource Capacity estimates indicate that this area could provide 11,191 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trail locations have been identified. A potential 25 acre walk-in type campground has been identified near Robinson Lake along the western edge of the Mt. Washington Wilderness. This site could accommodate 100 Persons-At-One-Time (PAOT) and provide 3,200 RVDs annually.

Mineral and Energy Resource The northern portion has eight geothermal leases from eight different companies. Some exploration work has been done.

Timber Resource The roadless area includes about 2,090 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 74 million board feet. If stands are converted to a managed condition, biological potential yield will be 268,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resource Most of the area south of Clear Lake is a high probability area for the presence of prehistoric sites. The area along the edge of the lava flows and along Bunchgrass Ridge may have

been an aboriginal travel route from Fingerboard Prairie area to the south. The northern part of the Mt. Washington West roadless area around Sand Mountain and Nash Crater has not been surveyed. Some sites may exist. The area in the vicinity of Clear Lake and north to the Santiam Pass area has high potential for the presence of historic sites associated with the Hogg railroad, Civilian Conservation Corps, and the Santiam Wagon Road which passes through the area.

Management Considerations

Fire Catastrophic fire frequency for this area is 250-600 years. No recent known fire activity has occurred.

Need

Nearby Wilderness and Its Use The Mt. Washington Wilderness (56,202 acres) lies adjacent to the roadless area, and the Mt Jefferson Wilderness (105,299 acres) is 1 mile north. To the south 5 miles is the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 80 miles by highway to the east of Albany, Oregon, 70 miles northeast of Eugene, and 40 miles northwest of Bend, Oregon.

Interest by Proponents The Mt. Washington West roadless area generated a low amount of interest with 44% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Mt. Washington West roadless area. In Alternatives NC, A, K, J, W, and L, 16 to 51% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Portions of this area contiguous to the Mt. Washington Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternatives D and L maintain the option of future Wilderness consideration for this area. Figure C-12-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Mt. Washington West roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-12-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-12-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	2,026
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	107	363	299	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	43	43	43	43	43		1,066
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	21	21	21	--	--	--
Management Area **9b**	--	107	107	107	107	--	107
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	277	405	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	4,501	4,671	4,394	4,330	4,650	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	6,100	21
Management Area **10f**	--	--	--	213	43	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	43	--	171	43	--	1.941
Management Area **11d**	192	21	192	--	--	--	--
Management Area **11e**	--	--	--	--	--	43	85
Management Area **11f**	469	256	469	256	107	149	1,386
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	1,450	1,514	1,429	1,130	875	--	--
15 Riparian [2]							
Management Area **15**	*	21-	*--	*--	21	21	21

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-12-3. Mt. Washington West Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	2,026
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	5,335	18
	Acres	--	--	--	--	--	6,100	21
Semiprimitive Motorized	RVDs	9,359	9,722	9,132	8,976	9,520	--	--
	Acres	4,501	4,671	4,394	4,330	4,650	--	--
Roaded Natural	RVDs	6,173	4,272	7,284	10,815	10,593	5,260	38,884
	Acres	725	491	853	1,216	1,152	576	4,629
Roaded Modified	RVDs	5,943	6,169	5,848	4,652	3,797	--	--
	Acres	1,450	1,514	1,429	1,130	875	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	4.0	4.0	4.0	6.0	8.0	8.0	8.0
Moderate Protection Level	Miles	1.0	2.0	0.0	--	0.0	--	--
Low Protection Level	Miles	3.0	3.0	4.0	3.0	--	--	0.0
Potential Trails								
Full Protection Level	Miles	7.0	7.0	7.0	7.0	--	8.0	7.0
Moderate Protection Level	Miles	1.0	1.0	1.0	1.0	8.0	--	--
Low Protection Level	Miles	--	--	--	--	0.0	--	1.0
Visual Quality Objectives								
Preservation	Acres	43	128	171	277	512	6,442	3,221
Retention	Acres	469	256	469	747	555	192	1,472
Partial Retention	Acres	4,714	4,778	4,607	4,522	4,735	43	1,984
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	1,450	1,514	1,429	1,130	875	--	--
1st Decade								
Road Construction	Miles	--	3.0	2.0	3.0	2.6	0.0	1.2
Area Harvested	Acres	--	385	287	385	252	--	82
Programmed Timber Harvest	MBF	--	3,061	2,016	2,877	2,215	48	647
Area Remaining Undeveloped	%	--	82	87	82	88	--	96
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	1,088	1,109	1,067	896	640	--	469
75-94% of Full Yield	Acres	768	811	768	704	768	21	--
50-74% of Full Yield	Acres	235	149	235	128	43	85	85
30-49% of Full Yield	Acres	--	--	--	--	--	--	277

Mt. Washington South - 4,224 Acres

Description

History The Mt. Washington South roadless area was considered for Wilderness by the United States Congress. They released the area for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 213 acres have been affected by development activities.

Location and Access T.15S., R.7 E.; T.16S., Rs.7 and 8. It is approximately 75 miles east of Eugene, Oregon situated along the southwestern boundary of the Mt. Washington Wilderness near McKenzie Pass. It can be accessed either by State Highway 242, or Scott Creek Road (Forest Road 2649).

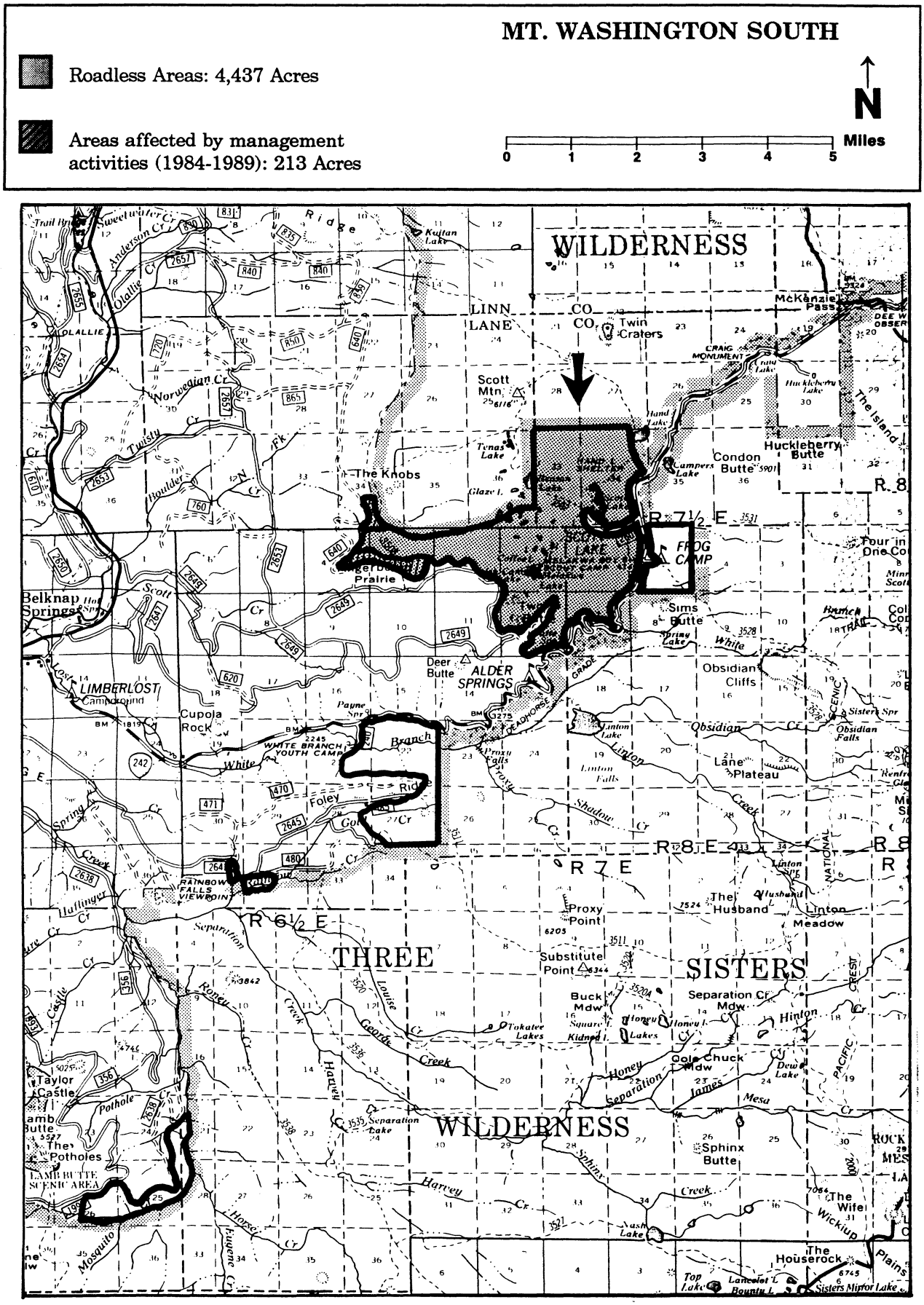
Geography and Topography The area is situated in the High Cascades Geographic Province and is characterized to the east and north by a series of lava bluffs and ridges and to the south and west by a lava plain, deeply dissected to the south. The western and northern portions are typified by fairly rolling, gentle terrain. The extreme southern edge is a steep, broad side-hill. The central section is an irregular series of small ridges and basins. Elevations range from 3,800 feet to 5,500 feet.

Soil Approximately 70% is made up of Landtype 73 and 736. About 15% is Landtype 710, 10% is Landtype 610, and 5% Landtype 3, 62, and 74. Generally it is a deep sandy loam over loam. There are about 768 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Douglas-fir occupies approximately 20% of the roadless area. This is primarily on the west and south portions. About 70% is a lodgepole pine/mountain hemlock/true fir mix. The remainder is rock and talus slopes and shrub cover.

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock *(Abies-Tsuga)* forest (004) and Pacific silver fir/Douglas-fir *(Abies-Pseudotsuga)* forest (003).

Figure C-13-1


MT. WASHINGTON SOUTH
Roadless Areas: 4,437 Acres
Areas affected by management activities (1984-1989): 213 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
LINN
LANE
Twin Craters
McKenzie Pass
Scott Mtn
Norwegian Cr
Twisty Cr
Boulder Cr
The Knobs
Huckleberry Butte
Condon Butte
The Island
R 7½ E
R 8
FROG CAMP
Belknap Springs
Sims Butte
Deer Butte
ALDER SPRINGS
LIMBERLOST
Cupola Rock
WHITE BRANCH YOUTH CAMP
Obsidian Cliffs
Obsidian Cr
Lane Plateau
Foley Ridge
Spring Cr
R 7 E
R 8 E
Proxy Point
The Husband
Linton Meadow
Substitute Point
THREE SISTERS
WILDERNESS
Separation Cr
Buck Mdw
Takatea Lakes
Hinton
Honey Mdw
Separation Lake
Sphinx Butte
Taylor Castle
The Potholes
LAVA BUTTE SCENIC AREA
Harvey Cr
Horse Cr
Mosquito Cr
Eugene Cr
The Houserock
Wickiup Plains
Top Lake
Lancelot L.
Bounty L.
Sisters Mirror Lake

Current Uses The entire area is classified in the 1977 Forest Land Management Plan as Dispersed Nonmotorized Recreation/Timber with the exception of the western edge which is classified as General Forest. The Dispersed Nonmotorized Recreation/Timber portion is primarily being managed for primitive recreation under a Recreation Opportunity Spectrum (ROS) class of Semiprimitive Motorized. The western portion has experienced active harvest in the Wool Timber Sale area. The Boy Scouts of America run an organizational camp, Camp Melakwa, near the center of the area. At the eastern edge of the area, immediately west of Scott Lake, a developed campground is heavily used each year from July through September. Benson Trail is also popular with hikers and backpackers as an access route to the Mt. Washington Wilderness. Use is in excess of 10,000 Recreation Visitor Days (RVDs) per year, virtually all of it occurring at Scott Lake Campground and Camp Melakwa. Since this area was inventoried in 1984 management activities are estimated to have affected 320 acres of the area.

Appearance The western edge is mostly mature Douglas-fir forest. The southern-most portion is the northern valley wall for White Branch Creek and is mostly brush covered with some rocky areas. The central portion is a series of small lakes separated by small rocky ridges. Tree cover is moderate and mostly western hemlock, Douglas-fir, and lodgepole pine with occasional small openings.

Surroundings The west and southwest lands are intensively managed for timber production. To the north is the Mt. Washington Wilderness which is managed to provide opportunities for primitive recreation and solitude. The south, southeast, and east are bordered by State Highway 242. This is a seasonal route used primarily by recreationists and sightseers. The highway is a corridor between Mt. Washington Wilderness and Three Sisters Wilderness.

Attractions Melakwa Lake, Coffee Lake, Two Buttes, and Benson Trail are the main attractions.

Capability

Manageability and Boundaries The boundary is effected by roads and timber harvest units, Camp Melakwa, and Scott Lake Campground.

Natural Integrity Harvested units, recreational facilities, trails, and unimproved roads occupy a small part of the total area.

Natural Appearance With the exception of the organization camp, campground, and harvest activities, the area would appear natural to most visitors.

Opportunity for Solitude Topographic screening is good throughout about half the area and vegetative screening is good over the other half. Noise and use of State Highway 242, Scott Lake Road, the Boy Scout camp, and the developed campground could affect a feeling of solitude for some visitors.

Opportunity for Primitive Recreation There are moderate to good opportunities, with several small lakes in the central portion. Overall diversity is fair to good and there are few trails. The southern portion is nearly impassable because of thick brush.

Special Features The area contains only common features. No federally listed endangered or threatened species are known to be present. Remnants of the Old Scott Trail remain as a cultural resource interest.

Availability

Resource Potential

Wildlife Resource This roadless area contains scattered openings and meadows which provide forage for 35 elk, black-tailed deer and mule deer in the summer months. Many of the lakes contain stocked trout. Harvest areas of proper design and size would probably increase available forage for big-game. Restricting traffic would reduce harassment of elk.

Recreation Resource Capacity estimates indicate that this area could provide 7,655 RVDs of Semiprimitive recreation use. Potential trail locations and developed recreation sites have been identified.

Mineral and Energy Resource This roadless area is within the study boundaries of the Belknap-Foley Geothermal Area. Most of the area is classified in the "substantial development constraints" category. There is little potential for mineral development.

Timber Resource The roadless area includes about 3,093 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 600 million board feet. If stands are converted to a managed condition, biological potential yield will be 282,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resource There is a high probability of finding sites within the entire roadless area. There are prehistoric travel routes and a historic route that make the probability high. One of these routes comes from the Obsidian Cliffs which was a major obsidian resource for Native Americans. Other sites may be associated with hunting and camps. Other high probility areas are around lakes and ponds.

Management Consideration

Fire Catastrophic fire frequency is 250-600 years. There has been no recent known fire activity.

Insects and Disease During the late 1960s and early 1970s extensive removal of white pine took place as a result of blister rust infestation. There have been no further known insect or disease related problems.

Need

Nearby Wilderness and Its Use The Mt. Washington Wilderness (56,202 acres) is adjacent to the Mt. Washington South roadless area on the north, and adjacent to the south is the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 70 miles by highway east of Eugene, Oregon, and 40 miles northwest of Bend, Oregon.

Interest by Proponents The Mt. Washington South roadless area generated a low amount of interest with 38% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Mt. Washington South roadless area. In Alternatives NC, A, and K, 19 to 25% of this area will be affected

by road construction and timber harvest. Alternatives D and L will develop 3% of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. In Alternative L, portions of this area contiguous to the Mt. Washington Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. All Alternatives maintain the option of future Wilderness consideration for most of this area. Figure C-13-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Mt. Washington South roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-13-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-13-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	320
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	3,797
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	3,008	--	--	--	--	--
Management Area **10c**	--	--	--	832	960	811	--
Management Area **10d**	3,413	--	3,413	--	--	--	--
Management Area **10e**	--	--	--	2,837	2,730	3,306	--
Management Area **10f**	--	149	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	21	448	21	--	--	--	--
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	85
Management Area **12b**	64	64	64	64	64	64	--
13 Special and Administrative Use							
Management Area **13a**	21	21	21	21	21	21	21
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	683	512	683	448	427	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-13-3. Mt. Washington South Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	320
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	3,548	--	3,548	3,041	2,850	3,580	--
	Acres	3,413	--	3,413	2,837	2,730	3,306	--
Semiprimitive Motorized	RVDs	--	8,138	--	1,945	2,504	1,880	--
	Acres	--	3,008	--	832	960	811	--
Roaded Natural	RVDs	1,012	6,199	1,012	765	765	765	39,268
	Acres	107	683	107	85	85	85	3,882
Roaded Modified	RVDs	2,962	2,316	2,962	2,050	1,955	95	95
	Acres	704	533	704	469	448	21	21
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	2.0	1.0	3.0	4.0	4.0	4.0
Moderate Protection Level	Miles	2.0	1.0	2.0	--	--	--	--
Low Protection Level	Miles	1.0	1.0	1.0	1.0	--	--	--
Potential Trails								
Full Protection Level	Miles	1.0	1.0	1.0	5.0	5.0	5.0	5.0
Moderate Protection Level	Miles	4.0	4.0	4.0	--	--	--	--
Low Protection Level	Miles	1.0	--	1.0	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	2,837	2,730	3,306	4,117
Retention	Acres	3,434	597	3,434	832	960	811	--
Partial Retention	Acres	85	3,093	85	85	85	85	85
Modification	Acres	21	21	21	21	21	21	21
Maximum Modification	Acres	683	512	683	448	427	--	--
1st Decade								
Road Construction	Miles	--	2.0	3.0	1.0	0.8	--	--
Area Harvested	Acres	--	295	278	122	79	--	--
Programmed Timber Harvest	MBF	--	2,385	2,010	811	653	--	--
Area Remaining Undeveloped	%	--	78	79	91	94	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	533	469	533	427	299	--	--
75-94% of Full Yield	Acres	--	2,133	--	--	--	--	--
50-74% of Full Yield	Acres	2,538	320	2,538	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Huckleberry - 853 Acres

Description

History The Huckleberry roadless area was considered for Wilderness by the United States Congress. They released the area for multiple-use management in the Oregon Wilderness Act of 1984.

Location and Access T.15S., R.8E. The area is approximately 75 miles due east and slightly north of Eugene, Oregon. It is bordered on three sides by the northern boundary of the Three Sisters Wilderness 2 miles west of McKenzie Pass. It can be accessed by State Highway 242, which parallels the area's northern boundary.

Geography and Topography The area is situated in the High Cascades Geographic Province in the midst of the several hundred square miles of recent lava activity in the McKenzie Pass area. The western half is typified by fairly rolling, gentle terrain. The eastern half is the Yapoah Lava Flow. Elevations range from 5,200 to 5,600 feet.

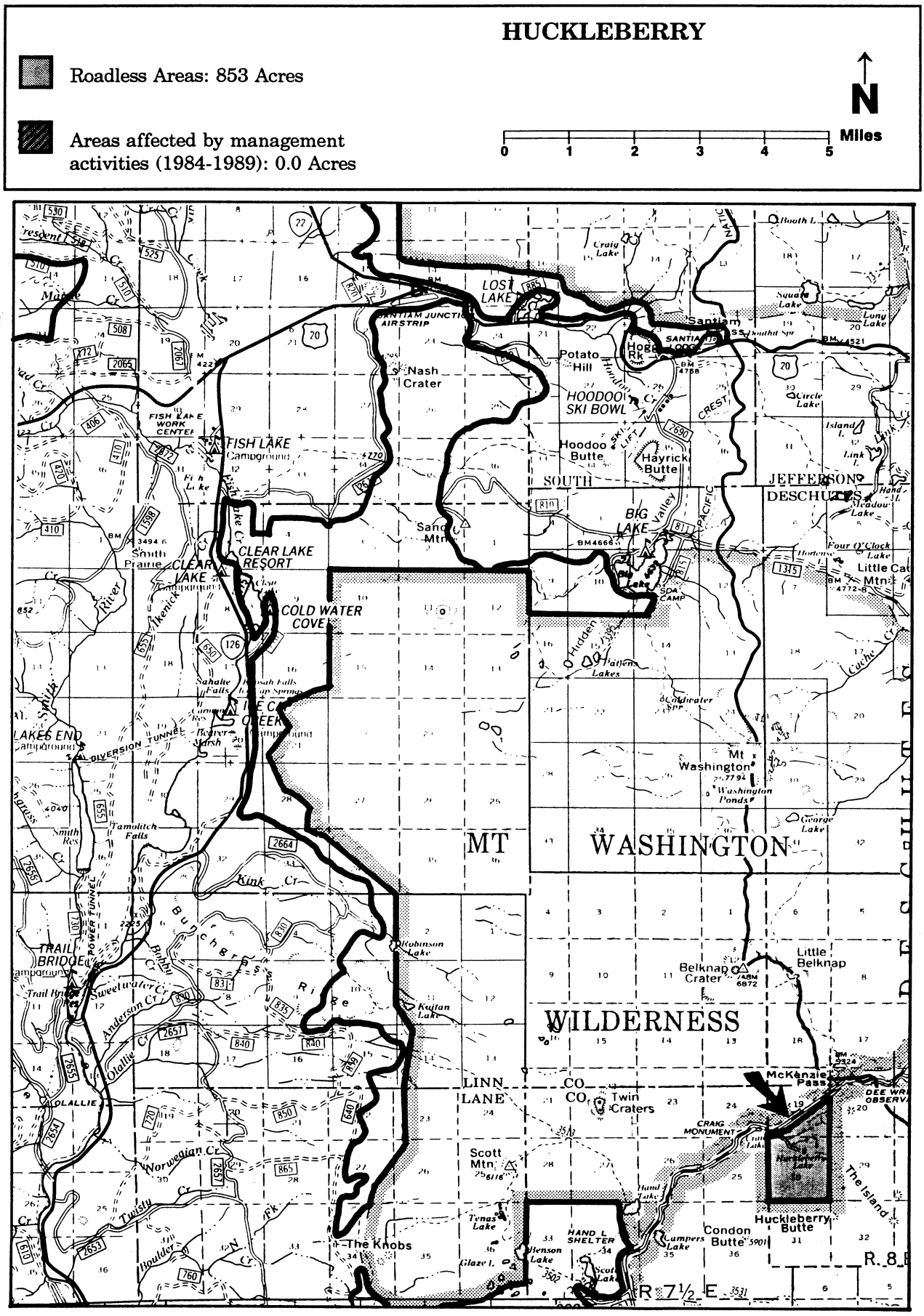
Soil Approximately 50% of the area is made up of Landtype 73 which is deep sandy loams over loams. The other 50% is lava flow. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Approximately 50% of the area, primarily to the west and south, is a lodgepole pine/mountain hemlock/true fir mix. The remainder is lava flow and is essentially barren with a few scrubby firs scattered through it.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock *(Abies-Tsuga)* forest (004).

Current Uses The entire area is classified in the 1977 Forest Land Management Plan as Dispersed Nonmotorized Recreation/Timber. The area is primarily being managed for primitive recreation. The Recreation Opportunity Spectrum (ROS) class is Semiprimitive Nonmotorized. Extending from the north central boundary southward to near its center is an old closed road bed. Hikers use this to access Huckleberry Lake. At Huckleberry Lake there are remains of a developed campground including toilets and tables which are no longer maintained. Use is approximately 500 Recreation Visitor Days (RVDs) per year.

Figure C-14-1


HUCKLEBERRY
Roadless Areas: 853 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
0 1 2 3 4 5 Miles
LOST LAKE
Santiam Junction Airstrip
Santiam Lodge
Potato Hill
Hoge Rk
Nash Crater
HOODOO SKI BOWL
Hoodoo Butte
Hayrick Butte
FISH LAKE Campground
FISH LAKE WORK CENTER
CLEAR LAKE RESORT
CLEAR LAKE Campground
COLD WATER COVE
SOUTH SANTIAM
BIG LAKE
SDA CAMP
Sand Mtn.
Smith Prairie
LAKES END Campground
DIVERSION TUNNEL
POWER TUNNEL
TRAIL BRIDGE Campground
Tamolitch Falls
Sahalie Falls
Koosah Falls
Koosah Springs
Clear Creek Campground
Clear Creek Marsh
Hidden Lakes
Coldwater
Mt Washington
Washington Ponds
MT WASHINGTON
Belknap Crater
Little Belknap
WILDERNESS
Robinson Lake
Kulton Lake
Twin Craters
McKenzie Pass
CRAIG MONUMENT
Scott Mtn.
Tenas Lake
Glazel L.
Olallie Lake
HAND L SHELTER
Condon Butte
Huckleberry Butte
The Knobs
The Island
Norwegian Cr.
Kink Cr.
Anderson Cr.
Sweetwater Cr.
Bunchgrass Ridge
Boulder Cr.
Twisty Cr.
Hunt Lake
Craig Lake
Square Lake
Long Lake
Circle Lake
Four O'Clock Lake
Little Cat Mtn.
Island L.
Link L.
Meadow Lake
Hand L.
Booth L.
Jefferson
Deschutes
Pacific Crest
Ski Lift
LINN CO
LANE CO
R. 7½ E
R. 8

Appearance The western half is rolling, fairly gentle land continuously covered with a true fir, western hemlock, and lodgepole pine forest. The eastern half is a lava flow. Near the center along the edge of the lava flow is Huckleberry Lake.

Surroundings The east, south, and west boundaries of the Huckleberry roadless area abuts the Three Sisters Wilderness. State Highway 242 forms the northern boundary. State Highway 242 is a seasonal route used by recreationists and sightseers when the highway is free of snow, usually July through October. Across the Highway is the Mt. Washington Wilderness. The area is essentially surrounded by Wilderness.

Attractions Huckleberry Lake and Yapoah Lava Flow are the main attractions.

Capability

Manageability and Boundaries Boundaries are easily managed.

Natural Integrity The area is in essentially pristine condition, with the exception of the old abandoned road which bisects most of the area, and an old campground which is located near the center of the area.

Natural Appearance With most visitors using the road and campground area, impact may be perceived by virtually everyone. The roadless area appears unnatural to most people, but evidence of unnaturalness is usually restricted to one of the senses.

Opportunity for Solitude Topographic screening is good throughout about half the area and vegetative screening is good over the other half. Offsite intrusions from State Highway 242 are perceptible. Traffic is generally moving during daylight hours for sightseeing and is not of a commercial nature.

Opportunity for Primitive Recreation Huckleberry Lake provides fishing and canoeing in a tranquil setting.

Challenging Experience The forested portion has few challenges. However, the lava flow is mostly rough, jagged, small ridges of rock and would afford some rock-scrambling opportunities.

Special Features The area represents ecological processes of subalpine vegetative communities on lava flows and could provide an opportunity for study of these communities. One isolated find of a cultural artifact is present. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potential

Wildlife Resource The Huckleberry roadless area is summer range for mule deer and year-round habitat for animal species that are endemic to the high alpine area. Small harvest units might contribute additional forage; but considering the harsh weather conditions and short growing season, the effort might not be cost effective.

Recreation Resource Capacity estimates indicate that this area could provide
518 Recreation Visitor Days (RVDs) of Semiprimitive Dispersed Nonmotorized recreation use. No potential trail locations or developed recreation sites have been identified.

Timber Resource The roadless area includes about 555 acres of land suitable for growing timber under managed conditions. Stands of mature lodgepole pine, true firs, and mountain hemlock occupy the area representing about 11 million board feet. If stands are converted to a managed condition, biological potential yield will be 42,949 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resource It is likely that there are additional prehistoric sites in the Huckleberry roadless area. They are probably associated with travel over the Cascade Range and gathering of camps by the Native Americans. This activity may have continued into the historic era with people from the Warm Springs Reservation using the area for hunting and gathering activities.

Management Considerations

Fire Catastrophic fire frequency is 250-600 years. No known fire activity has occurred recently.

Need

Nearby Wilderness and Its Use The Mt. Washington Wilderness (56,202 acres) is immediately across the highway to the north, and the Three Sisters Wilderness (283,593 acres) is adjacent to the remainder of the Huckleberry roadless area. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 75 miles by road to the east of Eugene, Oregon, and 40 miles northwest of Bend, Oregon.

Interest by Proponents The Huckleberry roadless area generated a low amount of interest with 77% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Huckleberry roadless area. In Alternatives K and W, 8% of this area will be affected by road construction and timber harvest. Alternatives NC, A, J, D, and L will develop from 4% of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Portions of this area contiguous to the Three Sisters Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. All Alternatives maintain the option of future Wilderness consideration for this area. Figure C-14-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Huckleberry roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-14-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-14-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	747	789	747	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	811
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	64	--	64	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	811	725	811	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	64	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	43	64	43	43	64	43	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	--	--	--	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-14-3. Huckleberry Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	793	749	793	760	782	760	--
	Acres	811	725	811	747	789	747	--
Semiprimitive Motorized	RVDs	--	--	--	77	--	77	--
	Acres	--	--	--	64	--	64	--
Roaded Natural	RVDs	346	741	346	346	445	346	8,026
	Acres	43	128	43	43	64	43	853
Roaded Modified	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	811	725	811	747	789	747	811
Retention	Acres	--	64	--	64	--	64	--
Partial Retention	Acres	43	64	43	43	64	43	43
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	--	--	--	--	--	--	--
1st Decade								
Road Construction	Miles	--	--	--	--	--	--	--
Area Harvested	Acres	--	--	--	--	--	--	--
Programmed Timber Harvest	MBF	--	--	--	--	--	--	--
Area Remaining Undeveloped	%	--	--	--	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	--	--	--	--	--	--	--
75-94% of Full Yield	Acres	--	--	--	--	--	--	--
50-74% of Full Yield	Acres	--	--	--	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Frog Camp - 469 Acres

Description

History The Frog Camp roadless area was considered for Wilderness by the United States Congress. They released the area for multiple use management in the Oregon Wilderness Act of 1984.

Location and Access T.16S., R.8E. The area is approximately 75 miles due east and slightly north of Eugene, Oregon. It is bordered on three sides by the northern boundary of the Three Sisters Wilderness 5 miles west of McKenzie Pass. It can be accessed by State Highway 242, which parallels the northern boundary.

Geography and Topography The area is situated in the High Cascades Geographic Province in the midst of the several hundred square miles of recent lava activity in the McKenzie Pass area. The northern half is typified by fairly rolling gentle terrain moderately dissected by two shallow ravines. The southern half is the northern slope of Sims Butte, one of many small cinder cones in the McKenzie Pass area. Elevations range from 4,700 feet to 5,200 feet.

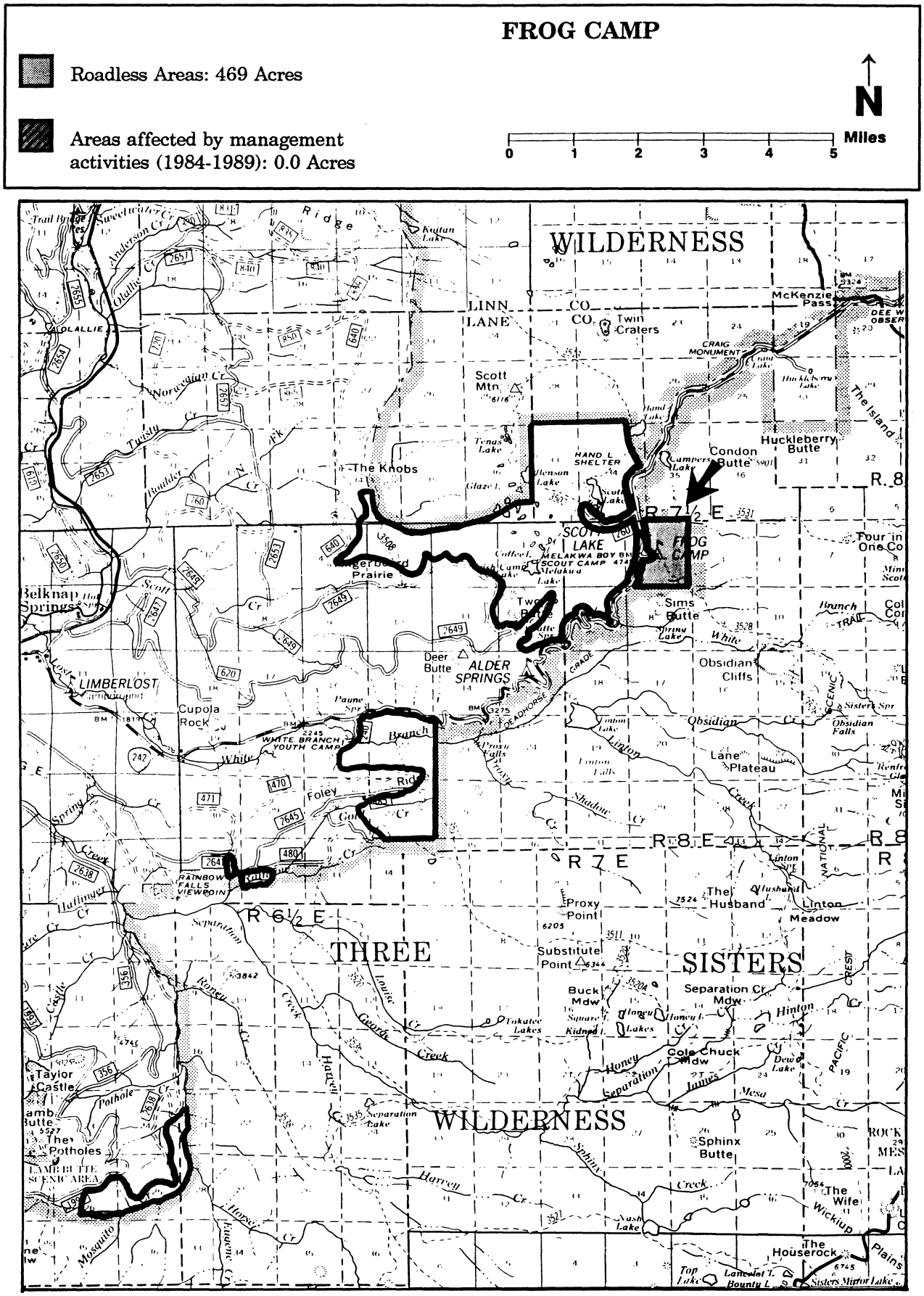
Soil The area is 35% Landtype 73, 35% Landtype 74, and 5% Landtype 6. These are deep soils of sandy loam over loam with low fertility. Growing season is short and cold. There are about 43 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The entire area is forested with a lodgepole pine/mountain hemlock/true fir mix.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock *(Abies-Tsuga)* forest (004).

Current Uses The entire area is classified in the 1977 Forest Land Management Plan (FLMP 1977) as Dispersed Nonmotorized Recreation/Timber. The area is primarily managed as Semiprimitive Nonmotorized Recreation Opportunity Spectrum (ROS). Extending from the west central boundary southeastward to its eastern border is Obsidian Trail (3528) which is used by hikers to access the Three Sisters Wilderness. Obsidian Trail is the most popular trail on the McKenzie Ranger District portion of the Three Sisters Wilderness. The area receives approximately 5,000 Recreation Visitor Days (RVDs) use per year, virtually all of it on the trail.

Figure C-15-1


FROG CAMP
Roadless Areas: 469 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
0 1 2 3 4 5
Miles
WILDERNESS
THREE SISTERS
WILDERNESS
LINN CO
LANE CO
FROG CAMP
SCOUT LAKE
ALDER SPRINGS
LIMBERLOST
R 7½ E
R 8 E
R 7 E
R 6½ E
R 8

Appearance The area is a continuous forest of lodgepole pine, mountain hemlock, and true fir, with occasional small openings. Two small streams run in the spring and early summer. The lay of the land is mostly gentle and rolling with the exception of the moderate incline in its southern portion.

Surroundings The north, south, and east boundaries abut the Three Sisters Wilderness. State Highway 242 forms the western boundary. State Highway 242 is a seasonal route used by recreationists and sightseers during the snow free months of July through October. Across the highway from the area is the Melakwa/Scott Lake Dispersed Nonmotorized Recreation/Timber (FLMP 1977) unroaded area.

Attractions Obsidian Trail is the main attraction.

Capability

Manageability and Boundaries Boundary would not be a management problem. Sight and sound along the highway would affect the primitive character of the wilderness resource.

Natural Integrity The area is in essentially pristine condition with the exception of the Obsidian Trail which bisects the area and is used heavily throughout the summer and fall.

Natural Appearance The area would appear natural to all but the most knowledgeable.

Opportunity for Solitude Topographic screening is moderate, and vegetative screening is good. Offsite intrusions (State Highway 242, Frog Campground, and trailhead) may be perceptible.

Opportunity for Primitive Recreation The trail provides good access to primitive recreation. There is minimal diversity; seasonal water sources dry up by mid-summer.

Special Features The area contains only common features. One major cultural resource site exists in this area. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potential

Wildlife Resource The Frog Camp roadless area currently supports medium populations of mule deer and black-tailed deer. Both of these species utilize the area during the summer months. Small harvest units would provide additional forage as long as adequate security areas are maintained.

Recreation Resource Capacity estimates indicate that this area could provide 327 RVDs of Semiprimitive Dispersed Nonmotorized recreation use. No potential trail locations or developed recreation sites have been identified.

Land Use Authorization A USGS snow pillow is operated under special use permit. There is little potential for other land uses.

Timber Resource The roadless area includes about 405 acres of land suitable for growing timber under managed conditions. Stands of mature lodgepole pine, true firs, and mountain hemlock occupy the area representing about 11 million board feet. If stands are converted to a managed condition, biological potential yield will be 31,910 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resource The Frog Camp roadless area has a very high potential for the presence of prehistoric cultural resources. These probably are associated with travel to and from the major obsidian source at Obsidian Cliffs as well as travel across the Cascade Range.

Management Considerations

Fire Catastrophic fire frequency is 250-600 years. No known fire activity has occurred recently.

Need

Nearby Wilderness and Its Use The Mt. Washington Wilderness (56,202 acres) is to the north 1 mile, and the Three Sisters Wilderness (283,593 acres) is adjacent on three sides. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 75 miles by road to the east of Eugene, Oregon, and 50 miles northwest of Bend, Oregon.

Interest by Proponents The Frog Camp roadless area generated a low amount of interest with 83% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Frog Camp roadless area. In Alternative K, 18% of this area will be affected by road construction and timber harvest. Alternative F will develop 4% of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in the developed portion of the area. Portions of this area contiguous to the Three Sisters Wilderness will remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. All Alternatives maintain the option of future Wilderness consideration for this area. Figure C-15-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Frog Camp roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-15-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-15-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	469
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	384	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	469	--	469	--	--	--	--
Management Area **10e**	--	--	--	469	469	469	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	85	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	--	--	--	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-15-3. Frog Camp Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	532	--	532	532	532	532	--
	Acres	469	--	469	469	469	469	--
Semiprimitive Motorized	RVDs	--	1,128	--	--	--	--	--
	Acres	--	384	--	--	--	--	--
Roaded Natural	RVDs	--	914	--	--	--	--	5,211
	Acres	--	85	--	--	--	--	469
Roaded Modified	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	1.0	1.0	1.0	1.0
Moderate Protection Level	Miles	1.0	1.0	1.0	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	469	469	469	469
Retention	Acres	469	85	469	--	--	--	--
Partial Retention	Acres	--	384	--	--	--	--	--
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	--	--	--	--	--	--	--
1st Decade								
Road Construction	Miles	--	0.5	0.5	--	--	--	--
Area Harvested	Acres	--	14	22	--	--	--	--
Programmed Timber Harvest	MBF	--	117	165	--	--	--	--
Area Remaining Undeveloped	%	--	89	84	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	--	--	--	--	--	--	--
75-94% of Full Yield	Acres	--	341	--	--	--	--	--
50-74% of Full Yield	Acres	405	64	405	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Gold Creek - 1,045 Acres

Description

History The Gold Creek roadless area was considered for Wilderness by the United States Congress. They released the area for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 256 acres have been affected by development activities.

Location and AccessT.16S., R.7E. The area is approximately 65 miles due east of Eugene, Oregon, situated along the northwestern boundary of the Three Sisters Wilderness approximately 15 miles east of McKenzie Bridge. It can be accessed by State Highway 126 and Foley Ridge Road (Forest Road 26543). The northern portion can be accessed by State Highway 242, which parallels the northern boundary.

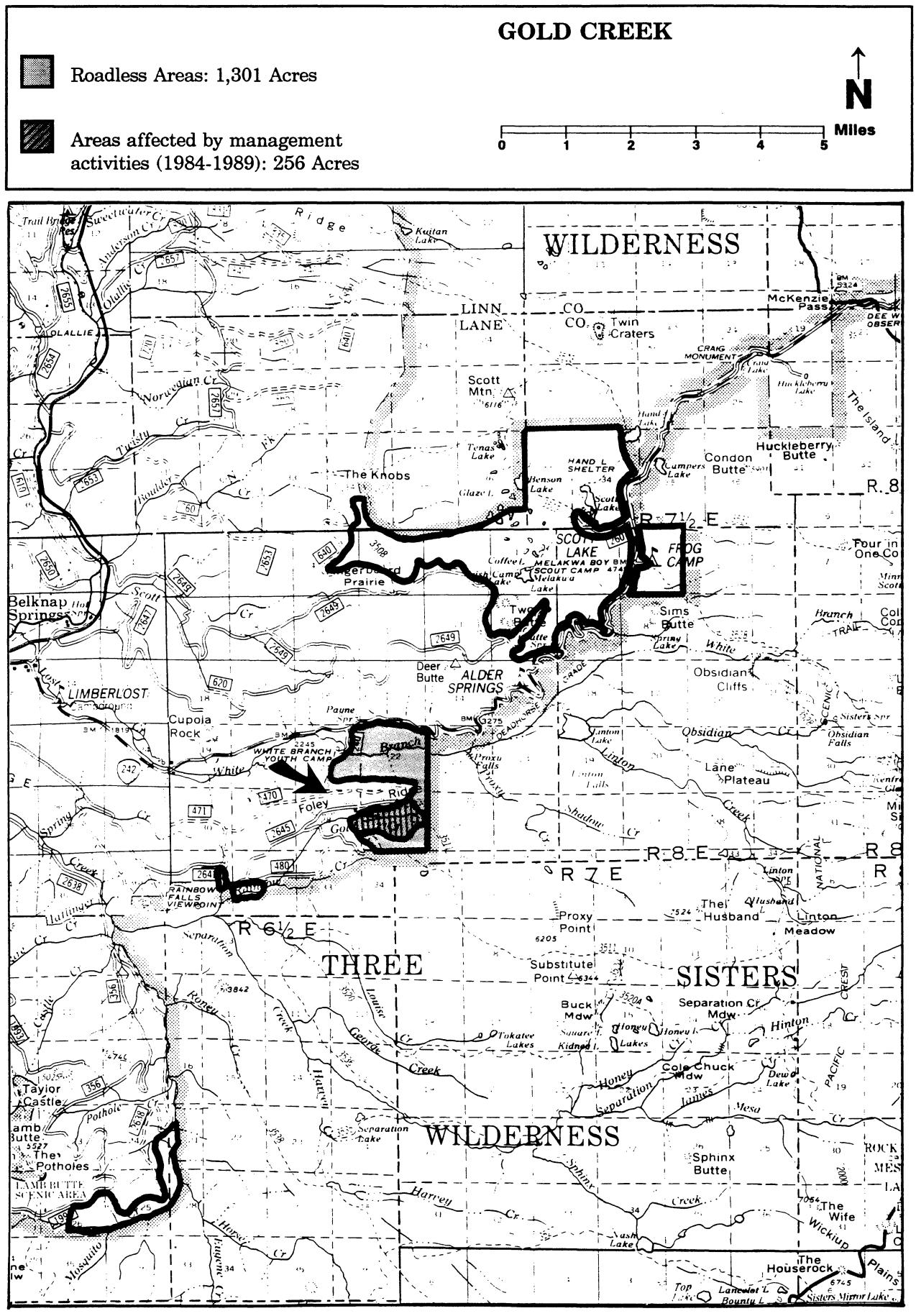
Geography and Topography The area is situated in the High Cascades Geographic Province and is characterized by the smooth, gentle terrain typical of lands immediately west of the Cascade Crest. The northern half is the southern wall of the White Branch Creek Drainage; the southern half is primarily gentle, rolling terrain moderately dissected by Gold Creek. Elevations range from 2,500 feet, near White Branch Creek, to 4,400 feet.

Soils The southern half is chiefly comprised of equal amounts of Landtypes 66 and 67. The northern half is predominantly Landtype 610, with small scatterings of Landtypes 62 and 63. The soil is deep sandy loams and loams over gravelly loams with low fertility. There are about 384 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The entire area is dominated by Douglas-fir forest. Toward the south and east, Douglas-fir is mixed with true fir, mountain hemlock, and lodgepole pine with no openings.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir *(Abies-Pseudotsuga)* forest (003).

Figure C-16-1


GOLD CREEK
Roadless Areas: 1,301 Acres
Areas affected by management activities (1984-1989): 256 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
THREE SISTERS
WILDERNESS
LINN CO
LANE CO
Twin Craters
McKenzie Pass
Scott Mtn.
The Knobs
Huckleberry Butte
Condon Butte
SCOTT LAKE
FROG CAMP
Belknap Springs
Deer Butte
ALDER SPRINGS
Sims Butte
Obsidian Cliffs
LIMBERLOST
Cupola Rock
WHITE BRANCH YOUTH CAMP
Foley Ridge
RAINBOW FALLS VIEWPOINT
Proxy Point
Substitute Point
Separation Lake
Taylor Castle
The Potholes
LAMB BUTTE SCENIC AREA
Sphinx Butte
The Wife
The Husband
The Houserock
Linton Meadow
Lane Plateau
Obsidian Falls
Separation Cr Mdw
Cole Chuck Mdw
Buck Mdw
Tokatee Lakes
Nash Lake
Sisters Mirror Lake
R 7½ E
R 8 E
R 7 E
R 6½ E
R 8

Current Uses The entire area is classified in the 1977 Forest Land Management Plan as General Forest and is managed with an emphasis on timber production. Current management includes annual maintenance for the Foley Ridge Trail (3511) and the Foley Cut-off Trail (3511A). These trails receive moderate use from hikers, trail stock, and backpackers for access to the Three Sisters Wilderness. The area receives approximately 500 Recreation Visitor Days (RVDs) use per year. The Recreation Opportunity Spectrum (ROS) class is Semiprimitve Nonmotorized.

Appearance The area is a continuous forest of mature Douglas-fir. Parts of the area near the existing Wilderness boundary are covered with continuous forests of Douglas-fir mixed with lodgepole pine, western hemlock, and true fir. Most of the area is fairly flat; the northern portion is a continuous, fairly steep, forested slope which serves as the southern wall of the White Branch Creek Valley.

Surroundings The southern and western boundaries abut the Three Sisters Wilderness. To the west is Foley Ridge, an area intensively managed for timber production and two large seed orchards. North is State Highway 242 and the northern wall of the White Branch Valley. The land north of the highway is in General Forest.

Attractions Foley Ridge Trail and Foley Cut-off Trail are the main attractions.

Capability

Manageability and Boundaries Boundaries are easily managed.

Natural Integrity Two trails are present, which do not interrupt the natural processes to any extent.

Natural Appearance The area would appear natural to most visitors.

Opportunity for Solitude Topographic screening is moderate and vegetative screening is good. Offsite intrusions (State Highway 242, White Branch Youth Camp, Foley Ridge Road, and Trailheads) may be perceptible.

Special Features The area contains only common features. No cultural features or federally listed endangered or threatened species are known to be present.

Availability

Resource Potential

Wildlife Resource The Gold Creek roadless area contains about 35 elk and resident deer that use the General Forest and adjacent Wilderness as summer range. The roadless areas provide hiding and thermal cover for both deer and elk and the adjacent clearcut areas provide forage. Management for early successional stages would provide additional forage for big-game, but could affect preferred travel corridors to winter range. Retaining older aged stands would benefit spotted owls, pileated woodpeckers, and other late successional stage dependant species.

Recreation Resource Capacity estimates indicate the area could provide 713 RVDs of Semiprimitive Dispersed Nonmotorized recreation use. No potential trail locations or developed recreation sites have been identified.

Mineral and Energy Resource The Gold Creek roadless area is within the study boundaries of the Foley-Belknap Geothermal Area. The northern half is classified in the "substantial development constraints" category; the southern half is classified in the "minimum development constraints' category. There is probably little potential for mineral development.

Timber Resource The roadless area includes about 811 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 37 million board feet. If stands are converted to a managed condition, biological potential yield will be 102,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resource There is potential to find sites in the area due to the presence of nearby sites along Foley Ridge. Early hunting and trapping activity by Euro-Americans are evident in these sites. Some potential sites may be associated with traveling, fall hunting, and gathering activities.

Management Considerations

Fire Catastrophic fire frequency is 250-600 years. No known fire activity has occurred recently.

Need

Nearby Wilderness and Its Use The Mt. Washington Wilderness (56,202 acres) is 3 miles to the north of the roadless area, and adjacent to the east is the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 55 miles by road to the east of Eugene, Oregon, and 55 miles northwest of Bend, Oregon.

Interest by Proponents The Gold Creek roadless area generated a low amount of interest with 50% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Gold Creek roadless area. In Alternatives NC, K, A, J, and W, 73 to 100% of this area will be affected by road construction and timber harvest. Alternative D will develop 22% of the area and Alternative L will develop 4%. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation-- will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternatives L and D, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Three Sisters Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Figure C-16-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Gold Creek roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-16-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-16-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	1,003
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	149	149	128	107	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	149	149	107	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	683	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	21	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	427	469	256	469	469	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	21
Management Area **11f**	128	85	107	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	21	21	21	21	21	21	21
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	469	235	448	235	235	213	--
15 Riparian [2]							
Management Area **15**	*	64	64	43	64	21	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-16-3. Gold Creek Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	291	--
	Acres	--	--	--	--	--	683	--
Semiprimitive Motorized	RVDs	--	--	--	304	415	304	--
	Acres	--	--	--	149	149	107	--
Roaded Natural	RVDs	3,260	3,754	3,507	2,840	2,420	247	6,643
	Acres	555	768	576	640	640	21	1,024
Roaded Modified	RVDs	1,405	1,215	1,310	1,120	1,120	1,025	95
	Acres	491	277	469	256	256	235	21
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	1.0	--	1.0
Moderate Protection Level	Miles	--	0.0	0.0	0.0	--	0.0	--
Low Protection Level	Miles	1.0	0.0	0.0	0.0	--	0.0	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	149	149	128	107	683	1,003
Retention	Acres	128	85	107	149	149	107	21
Partial Retention	Acres	427	533	320	512	533	21	--
Modification	Acres	21	43	21	21	21	21	21
Maximum Modification	Acres	469	235	448	235	235	213	--
1st Decade								
Road Construction	Miles	--	0.8	0.7	2.0	1.3	0.3	--
Area Harvested	Acres	--	63	67	194	101	45	--
Programmed Timber Harvest	MBF	--	555	562	1,706	906	724	15
Area Remaining Undeveloped	%	--	81	80	80	69	87	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	704	682	662	661	640	192	--
75-94% of Full Yield	Acres	--	43	43	43	--	--	--
50-74% of Full Yield	Acres	107	85	107	--	--	21	21
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Rainbow Falls - 43 Acres

Description

History The Rainbow Falls roadless area, which consisted of 469 acres, was considered for Wilderness by the United States Congress. They released 43 acres for multiple use management and designated 427 acres as additions to the Three Sisters Wilderness in the Oregon Wilderness Act of 1984.

Location and Access T.16S., R.7E. The area is approximately 60 miles due east of Eugene, Oregon, situated along the northwestern boundary of the Three Sisters Wilderness approximately 10 miles east of McKenzie Bridge and can be accessed by State Highway 126 and Foley Ridge Road (Forest Road 2643). Forest Trail 3543 goes through the west parcel.

Geography and Topography The Rainbow Falls roadless area is situated in the High Cascades Geographic Province and is characterized by the smooth, gentle terrain typical of lands immediately west of the Cascade Crest. The area is situated atop Foley Ridge, a long linear landform marked by a wide gently undulating top. The area is essentially flat with some slight rolling terrain. Elevations range from 2,800 to 3,200 feet.

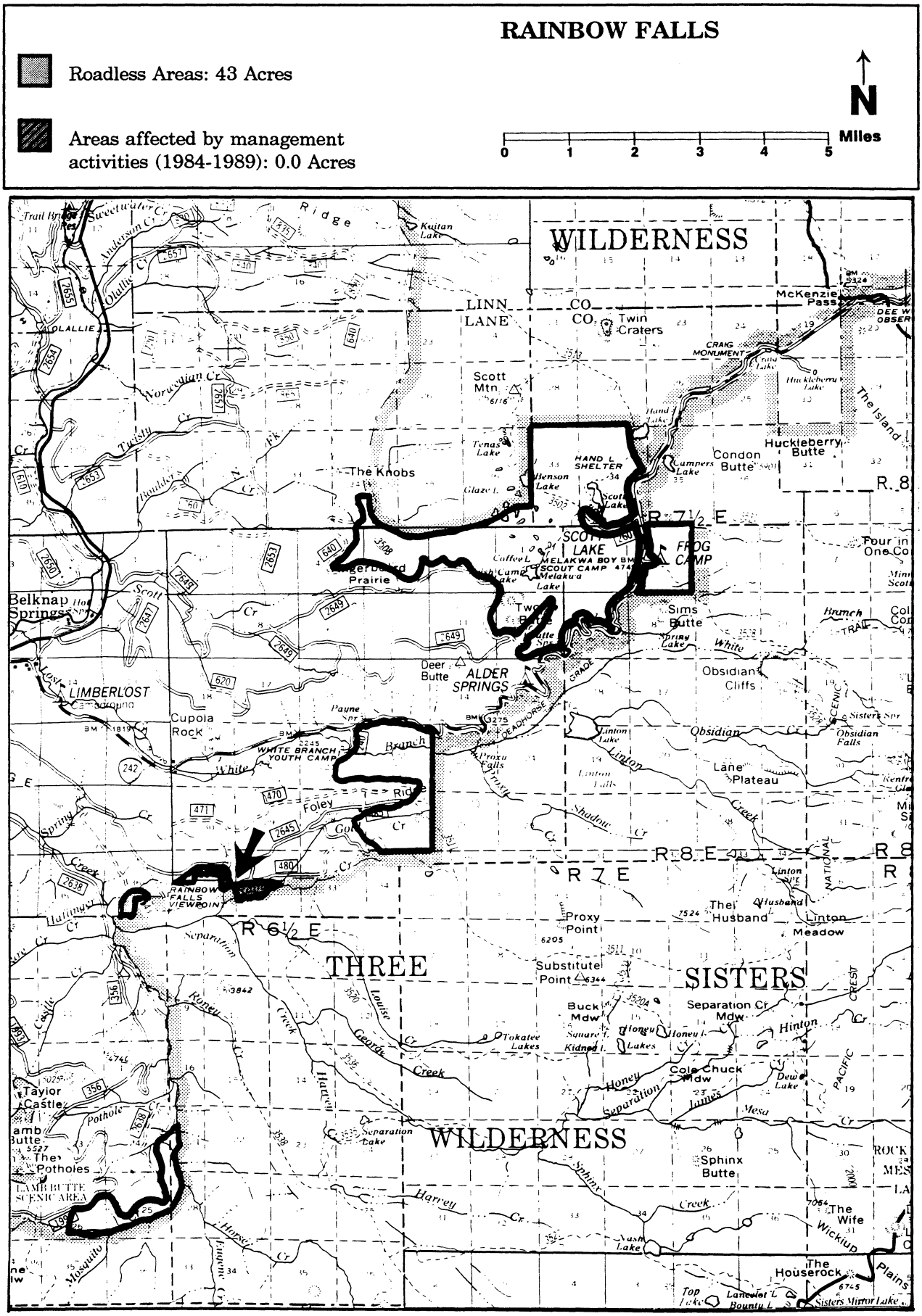
Soil The area is 100% Landtype 66, deep fine sandy loam and sandy loam over gravelly loam. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation About half of the area is dominated by mature Douglas-fir forests, the other half is primarily 20-year old managed second growth Douglas-fir.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir *(Abies-Pseudotsuga)* forest (003).

Current Uses The entire area is classified in the 1977 Forest Land Management Plan as General Forest and is managed with an emphasis on timber production. Approximately half of the area was clear-cut in the late 1960s. Forest Trail 3543 goes to the Wilderness viewpoint of Rainbow Falls.

Figure C-17-1


RAINBOW FALLS
Roadless Areas: 43 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
LINN CO
LANE CO
Twin Craters
McKenzie Pass
Scott Mtn
The Knobs
Huckleberry Butte
Condon Butte
The Island
Four in One Co
SCOTT LAKE
FROG CAMP
Belknap Springs
Prairie
Sims Butte
Deer Butte
ALDER SPRINGS
Obsidian Cliffs
LIMBERLOST
Cupola Rock
WHITE BRANCH YOUTH CAMP
Obsidian
Lane Plateau
Foley Ridge
RAINBOW FALLS VIEWPOINT
R 7 E
R 8 E
R 6½ E
R 7½ E
R 8
Proxy Point
The Husband
Linton Meadow
THREE SISTERS
Substitute Point
Separation Cr Mdw
Buck Mdw
Cole Chuck Mdw
Taylor Castle
The Potholes
LAMB BUTTE SCENIC AREA
WILDERNESS
Sphinx Butte
The Wife
The Houserock
Wickiup Plains
Sisters Mirror Lake

Appearance The area is basically flat, the east and west portions have an unbroken forest of old-growth Douglas-fir and the center section is made up of young Douglas-fir about 20 years old.

Surroundings The southern boundary adjoins the Three Sisters Wilderness. To the west, north, and east are two large seed orchards and Foley Ridge, an area intensively managed for timber production.

Capability

Manageability and Boundaries The plantations have altered the natural processes and eliminated its natural character.

Natural Integrity About 50% of the area has had a disruption to its natural processes. Evidence of harvesting activities includes skid roads and old stumps.

Natural Appearance The area would appear natural to some, but many would perceive past activities.

Opportunity for Solitude Topographic screening is poor and vegetative screening is good. Offsite intrusions (Foley Ridge Road and Foley Seed Orchard) and the limited size of the area limits opportunity for solitude.

Opportunity for Primitive Recreation There is little diversity, with the exception of two different aged timber stands. The dense stand of young Douglas-fir is not suitable for foot travel. There is a trail that goes to the Rainbow Falls Viewpoint.

Special Features The area contains only common features. No cultural resource features or federally listed endangered or threatened species are known to be present.

Availability

Resource Potential

Wildlife Resource The Rainbow Falls roadless area supports resident deer and elk by providing hiding and thermal cover adjacent to clearcut forage areas. The area is a transition zone between summer and winter range, and receives moderate use throughout the year, depending on weather conditions.

Recreation Resource Capacity estimates indicate that this area could provide 23 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified.

Timber Resource The roadless area includes about 21 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir and true firs occupy the area representing about one million board feet. If stands are converted to a managed condition, biological potential yield will be 2,602 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining 21 acres are unsuitable.

Management Consideration

Fire Catastrophic fire frequency is 250-600 years. No known fire activity has occurred recently.

Need

Nearby Wilderness and Its Use The Rainbow Falls roadless area is adjacent to the the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 55 miles by highway to the east of Eugene, Oregon, and 65 miles northwest of Bend, Oregon.

Interest by Proponents The Rainbow Falls roadless area generated a moderate amount of interest with 85% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Rainbow Falls roadless area. In all Alternatives 100% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Three Sisters Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Figure C-17-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Rainbow Falls roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, J, D, and W. Emphasis on amenity values such as visual quality are provided in Alternative L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-17-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-17-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	21
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	21
Management Area **11f**	--	--	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	43	43	43	43	43	43	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-17-3. Rainbow Falls Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	--	--	--	--	--	--	593
	Acres	--	--	--	--	--	--	43
Roaded Modified	RVDs	171	171	171	171	171	171	--
	Acres	43	43	43	43	43	43	--
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	--	--	--	--
Retention	Acres	--	--	--	--	--	--	21
Partial Retention	Acres	--	--	--	--	--	--	21
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	43	43	43	43	43	43	--
1st Decade								
Road Construction	Miles	--	0.1	0.1	0.1	0.1	0.0	0.1
Area Harvested	Acres	--	5.0	4.0	12.0	6.0	5.0	--
Programmed Timber Harvest	MBF	--	42	34	109	54	79	15
Area Remaining Undeveloped	%	--	62	69	13	55	65	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	21	21	21	21	21	21	--
75-94% of Full Yield	Acres	--	--	--	--	--	--	--
50-74% of Full Yield	Acres	--	--	--	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	21

Mosquito Creek - 406 Acres

Description

History The Mosquito Creek roadless area was considered for Wilderness in the 1977 Forest Land Management Plan. The United States Congress considered the area for Wilderness in the Oregon Wilderness Act of 1984. They released all 491 acres for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 85 acres have been affected by development activities.

Location and Access T.17S., R.6E. The area is approximately 50 miles east of Eugene, Oregon, situated along the boundary of the Three Sisters Wilderness approximately 10 miles southeast of McKenzie Bridge. Forest Road 1993 accesses the west end of the roadless area and Horse Creek Road (Forest Road 2638).

Geography and Topography The Mosquito Creek roadless area is situated near the break of the High Cascades and Western Cascades Geographic Provinces and is characterized by the steep, moderately dissected terrain typical of lands in the Western Cascades. The area is situated along Horse Creek on the east and Mosquito Creek on the south. The elevations range from 2,400 feet at Horse Creek to 4,800 feet at a point along Forest Road 1993.

Soil The area is made up of soils that are prone to severe surface erosion, droughty on south slopes, stable, and may be locally low in fertility. There are about 43 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

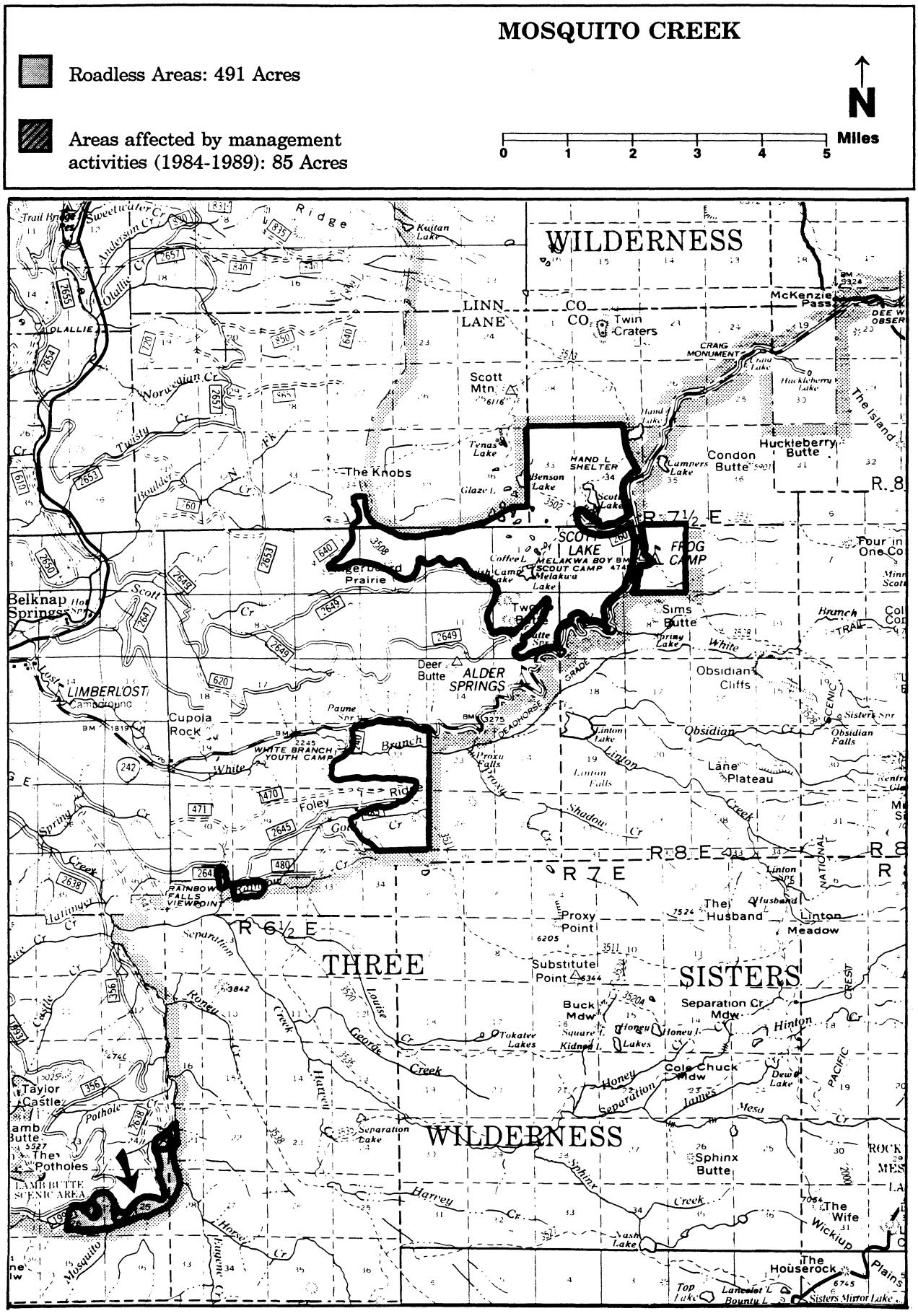
Vegetation About half of the area is dominated by dense old-growth and second growth Douglas-fir forests.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir *(Abies-Pseudotsuga)* forest (003).

Current Uses The entire area is classified in the 1977 Forest Land Management Plan as General Forest and is managed with an emphasis on timber production. Since this area was inventoried in 1984 management activities are estimated to have affected 16 acres of the area.

Appearance The area appears natural away from the roads and clearcuts.

Figure C-18-1


MOSQUITO CREEK
Roadless Areas: 491 Acres
Areas affected by management activities (1984-1989): 85 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
LINN
LANE
CO
CO
Twin Craters
McKenzie Pass
CRAIG MONUMENT
Scott Mtn.
Huckleberry Butte
Condon Butte
The Island
The Knobs
HAND L SHELTER
Benson Lake
Tenas Lake
Glaze L.
Hand Lake
Lampers Lake
R. 8
R. 7½ E
SCOUT LAKE
FROG CAMP
MELAKWA BOY BM
SCOUT CAMP
Melakwa Lake
Four in One Co
Belknap Springs
Prairie
Sims Butte
Spring Lake
Deer Butte
ALDER SPRINGS
Obsidian Cliffs
LIMBERLOST
Cupola Rock
WHITE BRANCH YOUTH CAMP
Obsidian Falls
Linton Falls
Lane Plateau
Foley Ridge
R. 8 E
R 7 E
RAINBOW FALLS VIEWPOINT
Proxy Point
The Husband
Linton Meadow
R 6½ E
THREE
SISTERS
Substitute Point
Buck Mdw
Separation Cr Mdw
Hinton
Tokatee Lakes
Cole Chuck Mdw
Dewey Lake
Taylor Castle
Separation Lake
WILDERNESS
Sphinx Butte
The Potholes
LAMB BUTTE SCENIC AREA
The Wife
Wickiup Plains
The Houserock
Top Lakes
Sisters Mirror Lake

Surroundings The southern boundary adjoins the Three Sisters Wilderness. To the west and north are clearcuts which includes area intensively managed for timber production. The Horse Creek corridor is managed for emphasis of scenery in the foreground.

Capability

Manageability and Boundaries The boundaries, located on nonconforming developments, are easily managed, and provide access to the area.

Natural Integrity As of 1985, the area is pristine with no development.

Natural Appearance The area would appear natural to most forest visitors.

Opportunity for Solitude Topographic screening is good and vegetative screening is dense. Offsite intrusions from the roads and the limited size of the area limits opportunity for solitude. Forest Road 1993 also accesses other popular recreation areas such as Quaking Aspen Swamp Botanical Area, Lamb Butte Scenic Area, and Ollalie Ridge Natural Area.

Opportunity for Primitive Recreation There is little diversity, with the exception of two different aged timber stands. The dense stand and steep slopes provides for cross country hiking.

Challenging Experience Cross country hiking through steep dense forests without any facilities is the most challenging experience.

Special Features The area contains only common features. No cultural resource features or federally listed endangered or threatened species are known to be present.

Availability

Resource Potential

Wildlife Resource The Mosquito Creek roadless area supports a moderate amount of big game and upland birds in the summer. Raptors forage in the grass and rock openings on the steep south-facing slopes. The area is utilized by spotted owls for foraging. The undisturbed vegetation along Horse and Mosquito creeks maintain optimum water quality for resident and anadromous fish. Management for later successional stages would maintain these conditions.

Recreation Resource Capacity estimates indicate that this area could provide 265 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified.

Timber Resource The roadless area includes about 299 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir occupy the area representing about 14 million board feet. If stands are converted to a managed condition, biological potential yield will be 44,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Management Considerations

Fire Catastrophic fire frequency is 250-600 years. No known fire activity has occurred recently.

Need

Nearby Wilderness and Its Use The Mosquito Creek roadless area is adjacent to the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 70 miles by road to the east of Eugene, Oregon.

Interest by Proponents The Mosquito Creek roadless area generated no responses for this inventory although responses concerning all areas in general may be applicable. This generated a high interest level with 67% of the responses favoring inclusion into the roadless inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Mosquito Creek roadless area. In Alternatives NC, A, K, D, W, and J, 95 to 100% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternative L, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Three Sisters Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternative L maintains the option of future Wilderness consideration for this area. Figure C-18-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Mosquito Creek roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, D, W, and J. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternative L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-18-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-18-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	277
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	21	--	21	--	21	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	107	--	107	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	--	--	--	--	64	107
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	277	384	277	384	363	320	--
15 Riparian [2]							
Management Area **15**	*	21	*--	21	21	21	21

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-18-3. Mosquito Creek Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	277
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	21	--	21	--	21	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	741	247	741	247	247	741	741
	Acres	107	21	107	21	21	85	128
Roaded Modified	RVDs	285	475	285	475	475	285	--
	Acres	277	384	277	384	363	320	--
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	21	--	21	--	21	--	277
Retention	Acres	--	--	--	--	--	64	107
Partial Retention	Acres	107	21	107	21	21	21	21
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	277	384	277	384	363	320	--
1st Decade								
Road Construction	Miles	--	0.5	0.2	1.0	0.5	0.5	0.1
Area Harvested	Acres	--	66	49	167	69	66	--
Programmed Timber Harvest	MBF	--	585	447	1,528	643	1,111	60
Area Remaining Undeveloped	%	--	49	63	100	47	49	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	171	277	171	277	256	235	--
75-94% of Full Yield	Acres	107	21	107	21	--	--	--
50-74% of Full Yield	Acres	--	--	--	--	--	64	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	85

French Pete (A) - 1,643 Acres

Description

History The French Pete roadless area was considered for Wilderness by the United States Congress. They released 1,728 acres for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 85 acres have been affected by development activities.

The South Fork Corridor Task Force, a group consisting of representitives from several environmental organizations and Willamette National Forest officials, has been working on proposed management options which would protect the scenic and recreational quality of the area and limit commercial timber harvest. All of the areas inventoried as the French Pete unroaded area are within the South Fork Corridor Area.

Location and Access Segment "A" includes a series of narrow strips of land between the present boundary of the Three Sisters Wilderness, and several Forest Roads including 1993, 1993641, 19, 19500, and 19534. The area is about 12 miles southeast of Blue River on the Blue River Ranger District stretching from East Fork Creek in T.17S., R.5E., to Dutch Oven Campground at T.18S., R.5E.

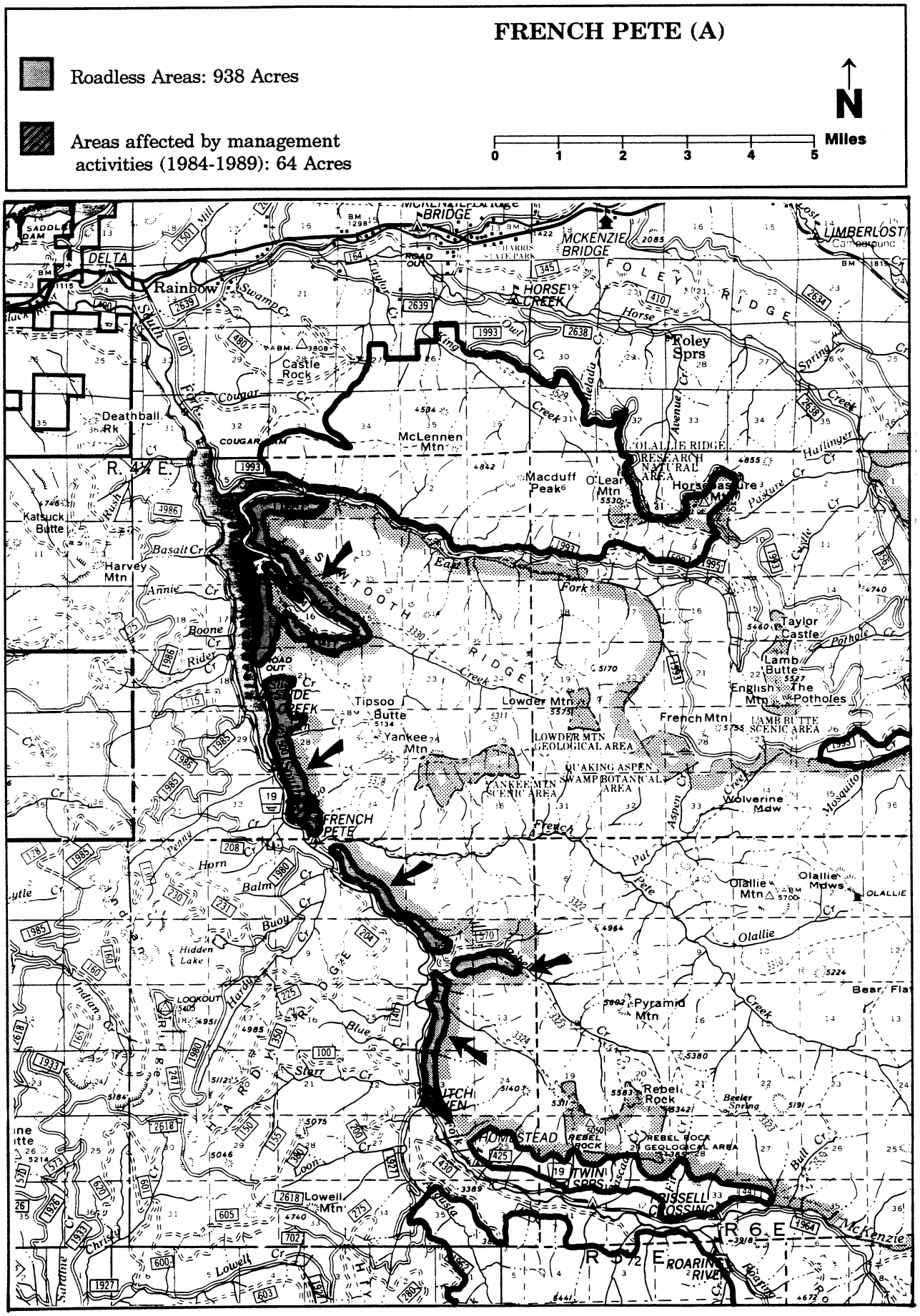
Geography and Topography The landform in Segment "A" is steep and moderately dissected by major stream channels and numerous smaller creeks and draws. Narrow benches of gentle slopes occupy some of the lower roadside areas; however, their number is limited. Elevations range from 2,000 feet on the north end to 2,400 feet on the south end. Where the boundary deviates up Rebel Creek and Walker Creek elevations are closer to 3,000 feet.

Soil Soils are thin and rocky on the steeper portions while modest accumulations of deeper, more fertile soil occupy the lower benches. There are about 235 acres that have potential for severe surface erosion; and approximately 21 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The major plant community is large diameter Douglas-fir second growth with associated western hemlock and western red cedar. Numerous pockets of old-growth Douglas-fir and western hemlock are intermixed, especially in the northern parcels. The southern parcels are typically second growth Douglas-fir.

Ecosystem Type There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir *(Abies-Pseudotsuga)* forest (003).

Figure C-19a-1



Current Uses The 1977 Land Management Plan for the Willamette National Forest allocated most of the land to Scenic Influence I and Scenic Influence II. Recreation use on the east side of the roads is generally light. The steep natire of the hillside limits access. Past management has included several regeneration harvest units. Additionally, numerous roadside salvage harvests have occurred adjacent to all boundary roads and on virtually all of the flatter benches. Since this area was inventoried in 1984 management activities are estimated to have affected 57 acres of the area.

Appearances The appearance is a mature Douglas-fir forest and includes large and very large diameter Douglas-fir mixed with western hemlock and western red cedar. Immediately adjacent to the roads, where sunlight penetrates to the ground, the understory includes heavy brush consisting of rhododendron, vine maple, salal and Oregon grape. Snags and downed logs have been removed in salvage logging operations. Away from the roads, sunlight is reduced, producing a cool darkened woodland with minor amounts of vegetation but considerable quantities of dead and down logs. Patches of hardwoods such as maple and alder are scattered through the area where windthrows have created small openings in the canopy. Slopes are steep and broken by many small streams and draws. The ground is covered by litter and scattered brush, as well as small trees of shade tolerant varieties. Numerous game trails lace the ridges and terrain breaks where movement is easier.

Attractions The area offers an old-growth forest with pleasant views to motorists from Forest Road 19 (Aufderheide Forest Drive).

Capability

Manageability and Boundaries The boundaries described are easily and readily identified on the ground. Human intrusions could be controlled somewhat with exclusions of salvage operations and firewood cutting, making manageability less difficult.

Natural Integrity Salvage logging has both changed the canopy character, variety of tree sizes present, and removed dead logs and snags.

Natural Appearance Away from the immediate roadside zone there are no noticeable changes in natural appearance. Even within the roadside zone, where limited timber harvest has occurred, evidence is slight and only the most knowledgeable observer would notice the changes.

Opportunity for Solitude Diversity of topography offers screening potential in at least half the area, but is limited in the remainder. This is due primarily to the location adjacent to the existing Three Sisters Wilderness. Offsite intrusions of highway noise from Forest Road 19 are permanent and close.

Opportunity for Primitive Recreation The opportunity for this type of experience is moderate to high due mainly to the proximity of the Three Sisters Wilderness. There are no developed facilities in the area, with all maintained trails and trailheads in adjacent roaded areas.

Special Features Numerous sites and isolated finds have been identified along the South Fork of the McKenzie River. No federally listed endangered or threatened plants are known to be present. Bald eagles have been sighted in the area.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 197 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential developed recreation sites have been identified.

Wildlife Resource The French Pete (A) roadless area includes critical winter range for deer and elk. More than 100 elk are found wintering along the South Fork of the McKenzie River adjacent to the Three Sisters Wilderness. The northern portion borders Cougar reservoir and is potential bald eagle nest site habitat. Frequent bald eagle sightings have been reported during summer and winter months for the past several years. The South Fork of the McKenzie River and Cougar Reservoir are popular for fishing during the summer months. Timber harvesting would decrease the small corridor of thermal cover for deer and elk provided by the older aged stands. To improve thermal cover in the winter range, stands should be managed to produce large trees with the multi-canopy understory.

Timber Resource The roadless area includes about 1,194 acres of land suitable for growing timber under managed conditions. Site productivity classes range from III to V. The remaining area is unsuitable. Stands of mature Douglas-fir occupy the area representing about 56 million board feet. If stands are converted to a managed condition, biological potential yield will be 174,000 cubic feet per year at culmination of mean annual increment.

Minerals and Energy Resource Geothermal exploration was conducted by the State of Oregon, Department of Geology and Mineral Industries in 1980 and 1981 including test drilling adjacent to Forest Road 1994 in the Walker Creek vicinity.

Land Use Authorizations A special use permit exists for a buried powerline corridor adjacent to Forest Road 19. Most of the corridor will be within the road right-of-way but some may extend into the roadless area.

Cultural Resource This area has a very high potential for cultural resources. Numerous sites and isolated finds have been identified along the South Fork of the McKenzie River. The area was used heavily during prehistoric times for camping, fishing, and hunting. It is likely that additional undiscovered sites are located at nearly every major stream confluence and along the river. The area was also used heavily during historic times by sheepherders on their way to the high country.

Management Consideration Long term fire history suggests that this area was periodically subjected to numerous small fires over an extended time resulting in a mosaic of large fire resistant Douglas-fir, intermixed with younger Douglas-fir and western hemlock. More recent history indicates a scattered incidence of small, human caused, roadside fires, rapidly suppressed and not contributing to continued successional development. Current fuel loadings are light, ranging from 20 to 45 tons per acre.

Need

Nearby Wilderness and Its Use The French Pete roadless area is adjacent to the the Three Sisters Wilderness (283,539 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 45 miles by highway to the east of Eugene, Oregon.

Interest by Proponents The French Pete roadless area generated a high amount of interest which led to the formation of a citizens group. This group, The South Fork Corridor Task Force, was discussed earlier in the History section.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the French Pete (A) roadless area. In Alternatives NC, A, L, and K, 88 to 100% of this area will be affected by road construction and timber harvest. Alternatives J, L, and W will develop 45% of the area and D develops 4 perscent. As a result of this development, uses dependent on roadless conditions--such as

recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternative D, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Three Sisters Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternative D maintains the option of future Wilderness consideration for most of the area. Figure C-19a-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the French Pete (A) roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, L, and K. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives J, W, and D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-19a-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-19a-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	704	704	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	107
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	192	192	192	192	--	192
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	1,578	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	277	--	--	--
Management Area **11b**	--	704	--	--	--	--	--
Management Area **11c**	--	--	--	--	256	--	341
Management Area **11d**	277	--	213	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	405
Management Area **11f**	1,045	--	896	405	277	43	171
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	299	384	256	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	341	64	43	192	--	405

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-19a-3. French Pete A Roadless Area Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	1,822	--
	Acres	--	--	--	--	--	1,578	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	5,236	2,717	5,483	5,483	7,138	198	7,138
	Acres	1,344	555	1,386	1,365	1,642	64	1,642
Roaded Modified	RVDs	740	1,766	646	646	--	--	--
	Acres	299	1,088	256	277	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	1.0	1.0	2.0	2.0	--	1.0
Moderate Protection Level	Miles	1.0	0.0	1.0	--	1.0	--	1.0
Low Protection Level	Miles	1.0	1.0	1.0	1.0	--	--	0.0
Potential Trails								
Full Protection Level	Miles	2.0	3.0	3.0	7.0	10.0	10.0	7.0
Moderate Protection Level	Miles	8.0	4.0	7.0	3.0	--	--	3.0
Low Protection Level	Miles	--	2.0	--	--	--	--	1.0
Visual Quality Objectives								
Preservation	Acres	--	192	192	896	896	--	299
Retention	Acres	1,045	--	896	405	277	1,621	576
Partial Retention	Acres	299	363	299	64	469	21	768
Modification	Acres	--	704	--	277	--	--	--
Maximum Modification	Acres	299	384	256	--	--	--	--
1st Decade								
Road Construction	Miles	--	2.0	1.0	1.0	0.2	--	0.4
Area Harvested	Acres	--	175	209	129	26	--	36
Programmed Timber Harvest	MBF	--	1,499	1,640	1,127	228	--	260
Area Remaining Undeveloped	%	--	66	61	76	95	--	93
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	213	448	171	171	128	--	85
75-94% of Full Yield	Acres	149	363	128	--	43	--	--
50-74% of Full Yield	Acres	832	299	811	363	21	--	405
30-49% of Full Yield	Acres	--	--	--	--	--	--	128

French Pete (B) - 938 Acres

Description

History The French Pete roadless area was considered for Wilderness by the United States Congress. They released 1002 acres for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 64 acres have been affected by development activities.

The South Fork Corridor Task Force, a group consisting of representitives from several environmental organizations and Willamette National Forest officials, is working on proposed management options which would protect the scenic and recreational quality and limit commercial timber harvest. All of the areas mapped as the French Pete unroaded area are within the South Fork Corridor Area.

Location and Access Segment "B" includes land between the Three Sisters Wilderness and a series of logging roads south of Rebel Rock in T.18S., R.5E. The area is about 20 miles southeast of Blue River on the Blue River Ranger District.

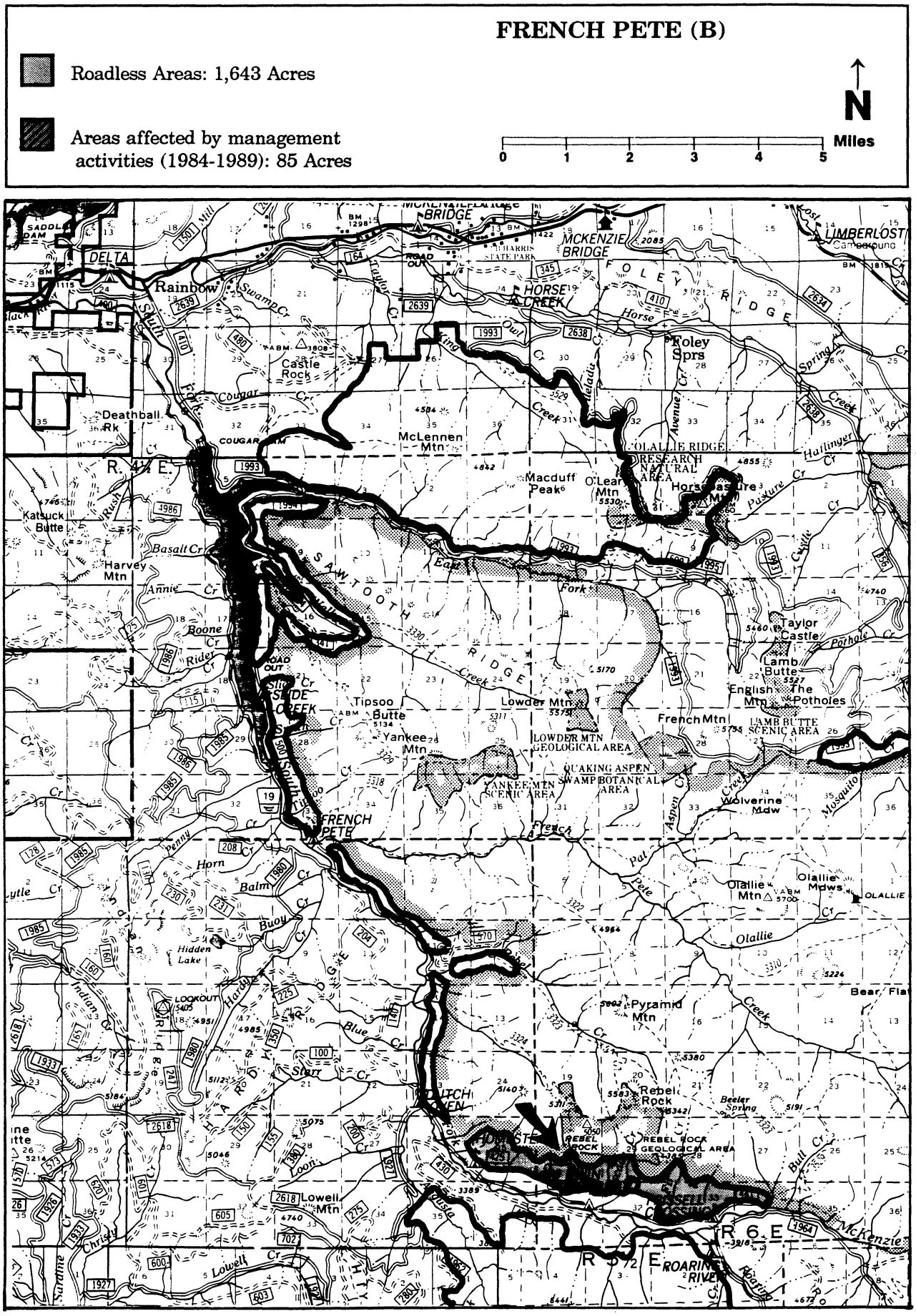
Geography and Topography The landform in Segment "B" is characterized by a broad, flat bench crossed by several sharply dissected stream channels. The northernmost edge rises sharply through a series of cliffs, rock outcrops, and steep rocky meadows into the Three Sisters Wilderness. Elevations range from 2,400 feet at the river on the west end to 3,000 feet near the boundary with the Wilderness on the east end.

Soil Soils are deep, mixed with river cobbles, and are generally fertile. The steeper portions are very thin, rocky soils intermingled with bare rock outcroppings and talus. There are about 213 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Most of the flat benchland has been logged and reforested with plantations of Douglas-fir and ponderosa pine. These are well developed, now approaching commercial thinning size. The lower slopes of the hillsides have been harvested recently while the upper rocky slopes are stocked with native stands of small diameter Douglas-fir and sugar pine. Much of the rocky ground is not forested and is occupied by grassy meadows and brushland.

Ecosystem Type There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock *(Abies-Tsuga)* forest (004).

Figure C-19b-1



Current Uses The present Land Management Plan for the Willamette National Forest (1977) allocated most of the area to Scenic Influence II and in a lesser extent to General Forest. Recreation use by dispersed campers (mostly deer and elk hunters), and by firewood cutters is considered light. A lightly used, unimproved trailhead provides visitor access into the Three Sisters Wilderness via the Frissel Way Trail (3529). Several large regeneration harvest units are within the boundary. The area is laced with tractor skid roads and low standard truck roads, many with gravel surfacing. Since this area was inventoried in 1984 management activities are estimated to have affected 61 acres of the area.

Appearances The appearance is that of a managed commercial forest including dense plantations of small diameter Douglas-fir and pine, with a surrounding fringe of medium diameter Douglas-fir which has been commercially thinned.

Attractions The area has no particular attraction but does provide a view of Rebel Rock and the surrounding cliffs for visitors who choose to detour briefly from Forest Road 19 (Aufderheide Forest Drive).

Capability

Manageability and Boundaries The boundaries described are easily located and readily identified on the ground. If the roaded and logged portion is deleted, only a small fringe of land remains.

Natural Integrity Timber harvest and system roads throughout this segment have highly interrupted natural processes. Intensive timber management has replaced the natural process over most of the area. Dispersed recreation, unimproved roads, and trails are present.

Ponderosa pine introduced into the plantations is not a native species on this site. Additional species have been introduced for wildlife forage and for erosion control. The ceanothus population, while native, has been unnaturally increased by planting to improve wildlife forage.

Natural Appearance The roads and timber management activities are obvious to all visitors. The area is not natural in appearance.

Opportunity for Solitude Most of the roadless area has dense vegetation which screens people from one another, even within a quarter mile, but there is sufficient opening to permit travel and camping without undue concentration. There is offsite intrusion of highway noise from Forest Road 19, heavily used by both recreationists and commercial log haulers.

Opportunity for Primitive Recreation The opportunity for this type of experience is moderate to high, due to the proximity to the Three Sisters Wilderness. There are no developed facilities other than one minimally developed trailhead.

Special Features Numerous archeological sites and isolated finds have been identified along the South Fork of the McKenzie River. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 99 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential developed recreation sites have been identified.

Wildlife Resource The French Pete roadless area includes critical winter range for deer and elk. More than 100 elk are found wintering along the South Fork of the McKenzie River adjacent to the Three Sisters Wilderness. The South Fork of the McKenzie River is popular for fishing during the summer months. Timber harvesting would decrease the small corridor of thermal cover for deer and elk provided by the older aged stands. To improve thermal cover in the winter range, stands should be managed to produce large trees with the multi-canopy understory.

Timber Resource The roadless area includes about 533 acres of land suitable for growing timber under managed conditions. Site productivity ranges from Class III to Class V. The remaining area is unsuitable. Stands of mature Douglas-fir occupy the area representing about 18 million board feet. If stands are converted to a managed condition, biological potential yield will be 78,000 cubic feet per year at culmination of the mean annual increment.

Cultural Resource This area has a very high potential for cultural resources. Numerous sites and isolated finds have been identified along the South Fork of the McKenzie River. The area was used heavily during prehistoric times for camping, fishing, and hunting. It is likely that additional undiscovered sites are located at nearly every major stream confluence and along the river. The area was also used heavily during historic times by sheepherders on their way to the high country.

Management Considerations Fire history suggests that this area was periodically subjected to numerous small fires over an extended time resulting in a mosaic of different age classes. Current management, designed to protect the investment, has attempted to eliminate wildfire except as needed for management purposes.

Need

Nearby Wilderness and Its Use The French Pete roadless area is adjacent to the the Three Sisters Wilderness (283,539 acres) and is within six miles of the Waldo Wilderness (37,157 acres) which is south. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 55 miles by highway to the east of Eugene, Oregon.

Interest by Proponents The French Pete roadless area generated a high amount of interest which led to the formation of a citizens group. This group, The South Fork Corridor Task Force, was discussed earlier in the History section.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the French Pete (B) roadless area. In Alternatives NC, A, K, and L, 95 to 100% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with Alternatives NC, A, K, and L, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Three Sisters Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternatives W, D, and J maintain the option of future Wilderness consideration for the most of the area. Figure C-19b-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the French Pete (B) roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, and L. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives W, D, and J. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-19b-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-19b-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	43	235	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	43
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	896	683	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	939	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	43	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	789
Management Area **11d**	43	--	43	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	64
Management Area **11f**	85	--	85	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	21	--	21	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	811	832	768	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	43	43	*--	--	--	43

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-19b-3. French Pete B Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	2,121	--
	Acres	--	--	--	--	--	939	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	1,482	667	1,902	8,076	8,076	--	8,076
	Acres	128	64	171	939	939	--	939
Roaded Modified	RVDs	2,638	2,942	2,468	--	--	--	--
	Acres	811	875	768	--	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	--	0.0	--	0.0	0.0	--	--
Moderate Protection Level	Miles	0.0	--	0.0	--	--	--	0.0
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	43	235	--	43
Retention	Acres	85	--	85	896	638	939	64
Partial Retention	Acres	43	64	85	--	21	--	832
Modification	Acres	--	43	--	--	--	--	--
Maximum Modification	Acres	811	832	768	--	--	--	--
1st Decade								
Road Construction	Miles	--	1.0	1.0	--	--	--	0.4
Area Harvested	Acres	--	81	101	--	--	--	28
Programmed Timber Harvest	MBF	--	692	788	--	--	--	197
Area Remaining Undeveloped	%	--	73	66	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	363	384	341	--	--	--	320
75-94% of Full Yield	Acres	85	128	107	--	--	--	--
50-74% of Full Yield	Acres	85	--	85	--	--	--	149
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Roaring River - 2,048 Acres

Description

History The Roaring River roadless area was considered for Wilderness by the United States Congress. They released 2,410 acres for multiple use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 362 acres have been affected by development activities. Since the release of these lands in 1984, approximately 362 acres have been affected by development activities.

Location and Access The Roaring River roadless area is located about 24 miles southeast of Blue River on the Blue River Ranger District immediately adjacent to the Three Sisters Wilderness. This area may be found in T.19S., R.6E. The area is accessed by Forest Roads 1856 and 1922; and Forest Trails 3510 and 3307 (Roaring River Ridge Trail).

Geography and Topography The terrain is very steep and rocky in the northern half between the South Fork of the McKenzie River and Elk Creek, gradually flattening out to gentle rolling ridges along the southern portion of Roaring Ridge. Elevations range from 3,000 feet along the South Fork to 5,600 feet at the top of Roaring River Ridge.

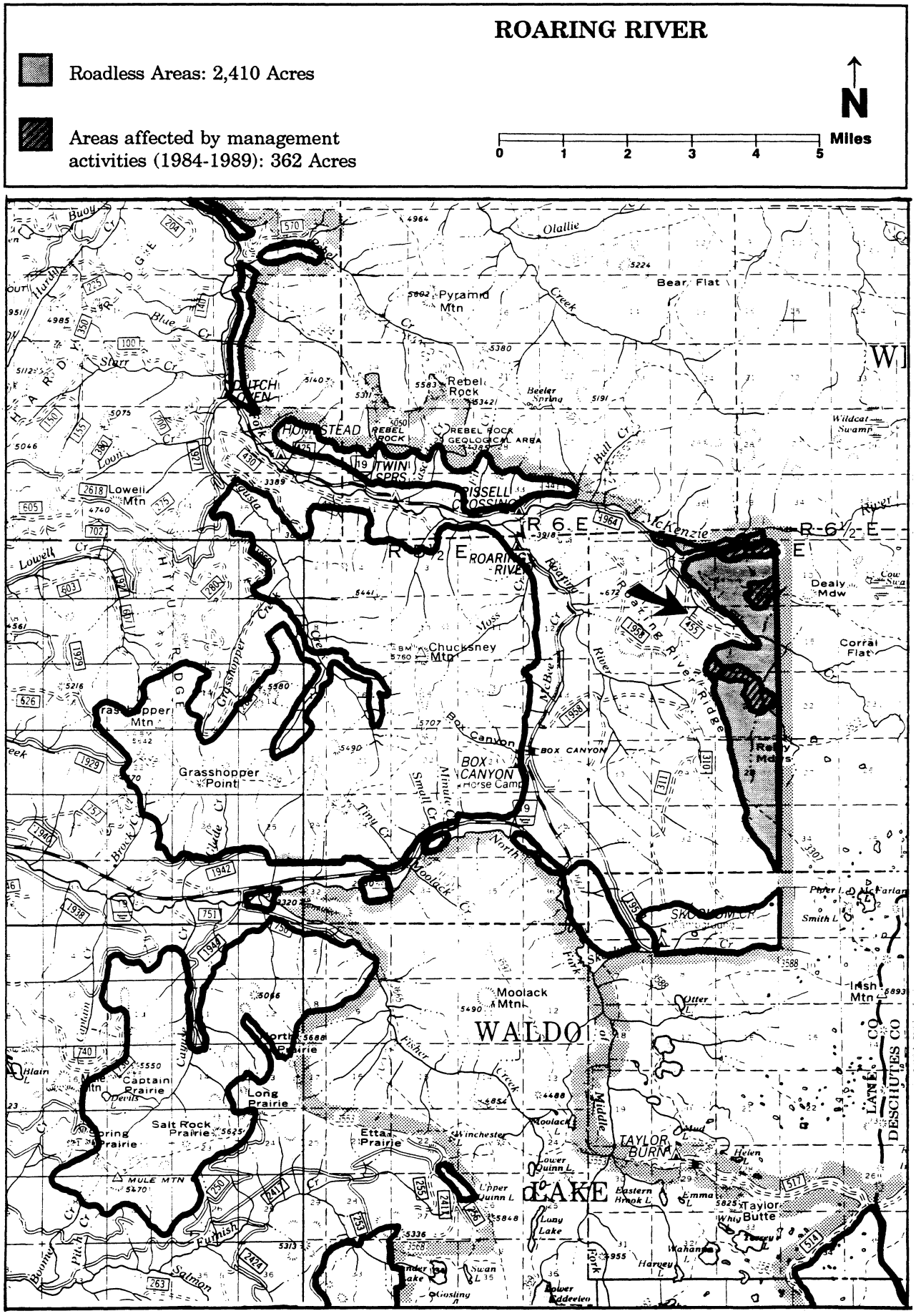
Soil Soils range from shallow and rocky along the steep side slopes to deep and moderately fertile on the valley bottoms. The gentle benches along Roaring River Ridge include moderately deep ash derived soils of low fertility. There are about 555 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The better soils support large diameter Douglas-fir and western hemlock, while the high elevation lands along Roaring River Ridge include smaller diameter lodgepole pine mixed with true firs and mountain hemlock.

Ecosystem Type There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses The 1977 Land Management Plan for the Willamette National Forest allocated most of this land to General Forest Management with special visual management corridors along access trails into the Three Sisters Wilderness. The low site land along Roaring River Ridge is considered marginal for timber production. Recreation use is moderate. Two trails crossing the roadless area, Elk Creek Trail 3510 and Roaring River Ridge Trail 3307, are fairly popular access routes into the Three Sisters Wilderness. The McBee Trail 3523 use is expected to increase as the new Box Canyon Horse Camp attracts more trail riders into the area. Since this area was inventoried in 1984 management activities are estimated to have affected 640 acres of the area.

Figure C-20-1


ROARING RIVER
Roadless Areas: 2,410 Acres
Areas affected by management activities (1984-1989): 362 Acres
N
0 1 2 3 4 5 Miles
R 6 E
R 6½ E
R 7 E
Roaring River
Box Canyon
BOX CANYON
Horse Camp
Rebel Rock
REBEL ROCK GEOLOGICAL AREA
HOMESTEAD
TWIN SPRS
RUSSELL CROSSING
Pyramid Mtn
Chucksney Mtn
Grasshopper Point
Moolack Mtn
WALDO
LAKE
TAYLOR BURN
Bear Flat
Dealy Mdw
Corral Flat
Long Prairie
Salt Rock Prairie
Ettal Prairie
Captain Prairie
MULE MTN
Taylor Butte
Lowell
Mckenzie River
Fisher Creek
Middle Fork
Smith L
Irish Mtn
LANE CO
DESCHUTES CO

Appearances The appearance changes markedly as a visitor climbs toward the Three Sisters Wilderness boundary. At the lower elevations, the landscape has the appearance of a mature second growth forest. Trees are medium to large diameter, primarily Douglas-fir and to a lesser extent, hemlock. They are regularly spaced, with a closed canopy reducing the amount of sunlight reaching the ground. Slopes are steep, and broken by many small streams and draws. The ground is covered by salal, Oregon grape, and vine maple, as well as smaller trees of shade tolerant varieties. Numerous game trails lace the ridges and terrain breaks where movement is easier.

As elevation increases, trees become smaller in size and more variety enters the stand including lodgepole pine, true fir, and mountain hemlock. The terrain becomes gentle and rolling as the high plateau is approached. The old pine stands at the southern edge contain large numbers of snags and spiketop trees. The canopy becomes more open, allowing sunlight to reach the ground. The surface vegetation changes with huckleberry and beargrass becoming the more common plants; small grassy meadows or marshes are occasionally encountered.

Surroundings The Roaring River Area is directly west and south of the Three Sisters Wilderness Area. Road corridors penetrate the area along the South Fork of the McKenzie River and Elk Creek. An additional road system has been built into the roadless area between Roaring River Ridge and Elk Creek. Extensive logging operations have taken place along the entire western edge, and new logging has been completed within the boundary throughout the northern half.

Attractions The Roaring River roadless area has no significant attractions within its borders. It does provide access to popular Wilderness attractions such as Reilly Meadows, McFarland and Smith lakes, and the Mink Lake Basin.

Capability

Manageability and Boundaries The boundaries described are easily identified and readily located on the ground. There are roads and harvested units within the area.

Natural Integrity Timber harvest in the northern half has altered the natural processes. Large and small clearcut units have changed the canopy characteristics and variety of tree sizes present and introduced other plant species through wildlife and erosion control plantings. Plant and animal species dependent on the closed canopy of large trees are reduced or eliminated in the harvested area, while other species preferring openings and earlier seral stages are increased. Slash treatment and fire control have changed the amount of woody debris and snag habitat available for small mammals and cavity nesting birds in and near the harvested units. Road cut and fill slopes contribute to increased erosion and sedimentation of downstream waterways. The natural processes have been interrupted.

Natural Appearance Newly constructed roads and the associated clearcut units are highly intrusive in appearance and are obvious to even the most casual observer. Even the smaller, patterned clearcuts intended to mimic natural openings can be identified as harvest units by knowledgeable visitors. This is especially obvious since the two popular trails pass through or are immediately adjacent to several units.

Opportunity for Solitude The Roaring River roadless area offers an opportunity for solitude partly due to its location adjacent to an existing Wilderness. This is offset somewhat by the obvious presence of timber management within the inventoried area. Opportunities for cross-country travel are limited in the north half but readily available in the south. The distance from the perimeter of the roadless area to the center of the Three Sisters Wilderness is in excess of eight miles.

Opportunity for Primitive Recreation The opportunity for this type of experience is relatively high due mainly to the proximity of an existing Wilderness as well as the lack of developed recreation sites and the low standard trail system currently in place.

Special Features The area contains mainly common features. Scattered findings of obsidian flakes indicate prehistoric use. No federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 1,373 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. No potential developed recreation sites have been identified.

Timber Resource The roadless area includes about 1,557 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, lodgepole pine, and mountain hemlock occupy the area representing about 51 million board feet. If stands are converted to a managed condition, biological potential yield will be 188,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Wildlife Resource Roaring River roadless area is used moderately by deer and elk as summer range. Timber harvesting would probably benefit game animals if proper cover conditions and road management were maintained.

Management Considerations

Fire Long-term fire history suggests that this area consistently has been burned by moderate size fires which maintained a mosaic of age classes and the presence of lodgepole pine. Current fuel loadings are variable, including very heavy tonnage in areas hit by insect and disease infestations.

Insects and Disease The southern half is heavily damaged by several disease organisms endemic to the area. Lodgepole pine suffers heavy loss from western gall rust, while the white pine population has been virtually eliminated by White pine blister rust. Western hemlock, mountain hemlock, and true firs are severely infested with dwarf mistletoe.

Need

Nearby Wilderness and Its Use The Roaring River roadless area is adjacent to the the Three Sisters Wilderness (189,346 acres) and two miles north of the Waldo Wilderness (37,157 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 70 miles by highway to the east of Eugene, Oregon.

Interest by Proponents The Roaring River roadless area generated a low amount of interest with 88% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Roaring River roadless area. In Alternatives NC, K, A, J, W, and D, 90 to 100% of this area will be affected by road construction and timber harvest. Alternative L will develop 18% of the area. As a result of this

development, uses dependent on roadless condition, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except alternative L, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Three Sisters Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternative L maintains the option of future Wilderness consideration for most of this area. Figure C-20-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Roaring River roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, D, W, and J. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternative L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-20-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-20-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	1,685
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	213	149	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	171	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	299	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	320
Management Area **11d**	811	--	811	576	640	320	--
Management Area **11e**	--	--	--	--	--	--	43
Management Area **11f**	--	--	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	1,237	2,005	1,194	1,216	917	1,514	--
15 Riparian [2]							
Management Area **15**	*	43	43	43	43	43	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-20-3. Roaring River Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	1,685
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	415	--
	Acres	--	--	--	--	--	171	--
Roaded Natural	RVDs	7,162	494	7,656	7,262	7,756	2,964	1,334
	Acres	811	43	853	832	832	363	363
Roaded Modified	RVDs	2,734	5,392	2,544	2,771	2,582	3,816	--
	Acres	1,237	2,005	1,194	1,216	1,216	1,514	--
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	1.0	1.0	2.0	--	1.0	4.0
Moderate Protection Level	Miles	3.0	--	3.0	2.0	6.0	1.0	0.0
Low Protection Level	Miles	3.0	5.0	3.0	2.0	--	4.0	1.0
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	213	149	--	1,685
Retention	Acres	--	--	--	--	--	171	43
Partial Retention	Acres	811	43	853	619	683	363	320
Modification	Acres	--	--	--	--	299	--	--
Maximum Modification	Acres	1,237	2,005	1,194	1,216	917	1,514	--
1st Decade								
Road Construction	Miles	--	2.0	2.0	2.0	2.0	0.9	0.2
Area Harvested	Acres	--	246	294	341	185	287	16
Programmed Timber Harvest	MBF	--	2,104	2,302	2,975	1,619	1,691	116
Area Remaining Undeveloped	%	--	63	55	49	71	57	98
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	1,003	1,493	960	832	683	1,130	235
75-94% of Full Yield	Acres	555	43	576	555	619	256	--
50-74% of Full Yield	Acres	--	21	21	21	64	21	43
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Mt. Hagan - 6,292 Acres

Description

History The Mt. Hagan roadless area was considered for Wilderness by the United States Congress. They released the area for multiple-use management in the Oregon Wilderness Act of 1984.

Location and Access T.16S., Rs.3 and 4E. The Mt. Hagan Roadless Area consists of 5,723 acres of National Forest lands lying just northwest of the town of Blue River within the Blue River Ranger District.

Access is provided by Forest Road 107 on the east, Forest Road 2611 on the south, BLM Road 16-3E-263 on the southwest, and the South Fork Gate Creek Road on the north. Only Forest Road 107 is available for public access. The other roads are either privately owned, or cross private lands without permanent easements to allow public use.

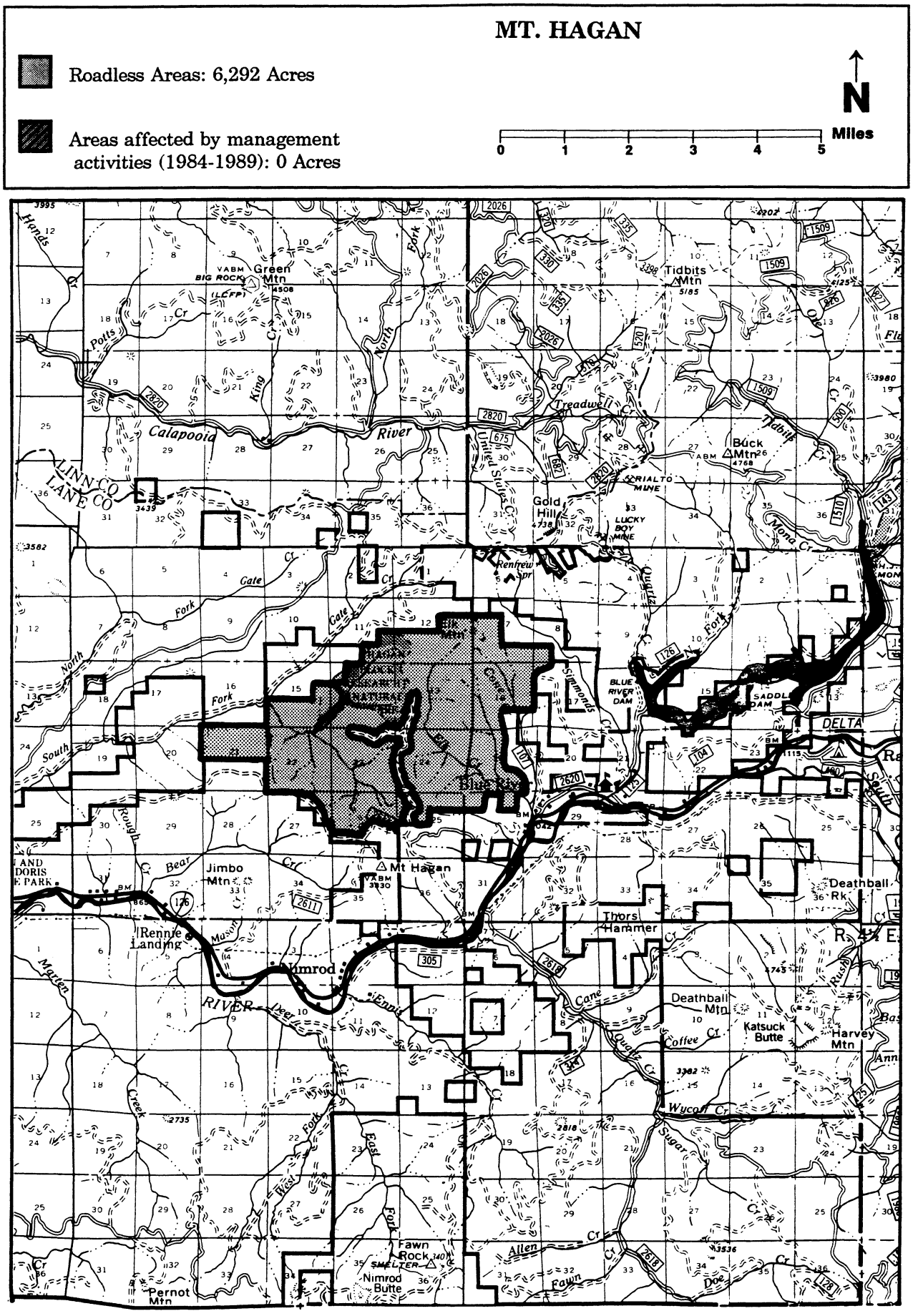
Geography and Topography The area is characterized by very steep convex dissected upper slopes. Elevations range from 1,200 feet at Elk Creek to 4,000 feet at Elk Mountain. Lower slopes are steep, smooth, and dissected. The steeper upper slopes are interspersed with occasional rock outcroppings.

Soil Soil depths range from 6 to 24 inches on upper slopes and from 24 to 60 inches on the lower hillsides, with high to very high surface erosion hazards. Deep seated mass failures are not unusual, and smaller landslides and debris avalanches can be found throughout the area. There are about 5,460 acres that have potential for severe surface erosion; and approximately 3,029 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The primary forest cover consists of second growth Douglas-fir mixed with smaller quantities of western hemlock. Stand ages generally range from 80 to 120 years. Old-growth timber is scarce and widely scattered, usually appearing as isolated individuals or small patches of residual trees.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is cedar/hemlock/Douglas-fir (*Thuja-Tsuga-Pseudotsuga*) forest (002).

Figure C-21-1


MT. HAGAN
Roadless Areas: 6,292 Acres
Areas affected by management activities (1984-1989): 0 Acres
N
0 1 2 3 4 5 Miles
Green Mtn
Tidbits Mtn
Buck Mtn
Gold Hill
Calapooia River
LINN CO
LANE CO
Treadwell Cr
Mona Cr
Blue River
DELTA
Mt Hagan
Jimbo Mtn
Rennie Landing
Nimrod
RIVER
Deathball Mtn
Deathball Rk
Thors Hammer
Katsuck Butte
Harvey Mtn
Wycoff Cr
Fawn Rock
Nimrod Butte
Pernot Mtn

Current Uses The 1977 Land Management Plan for the Willamette National Forest allocates most of this land to General Forest. A parcel on the north boundary is allocated to the proposed Hagan Block Research Natural Area.

As of 1985, two timber sales were planned. All preparatory work has been completed, but the projects have been held pending review of the Wilderness potential for the area. Prior management has included commercial thinning of timber adjacent to Forest Roads 2611, 2611080, and 2611090.

The proposed establishment of the Hagan Research Natural Area has been in the planning stages since 1974. While no establishment report has been approved, a great deal of research has taken place, and several active research projects are under way.

Recreation use is light, public access is limited, no maintained recreation trails, and no unique or scenic features exist to attract visitors.

Appearances The appearance is fairly consistent, typically that of a young second growth forest. Trees are medium in diameter, primarily Douglas-fir, and to a lesser extent western hemlock. They are regularly spaced, with a closed canopy reducing the amount of sunlight reaching the ground. Patches of hardwoods such as maple and alder are scattered throughout the area where windstorms or landslides have created small openings in the canopy. Slopes are steep and broken by many small streams and draws. The ground is covered by salal, Oregon grape, and rhododendron as well as smaller trees of shade tolerant varieties. Numerous game trails lace the ridges and terrain breaks where movement is easier.

In the northeast corner, near Elk Mountain, trees become smaller in size and more variety occurs in the stand, including more true fir and mountain hemlock. The terrain becomes steeper and still more broken with rock outcrops and sharp spur ridges common. The canopy becomes more open, allowing sunlight to reach the ground. Surface vegetation changes with huckleberry and beargrass becoming the more common plants.

Surroundings The Mt. Hagan roadless area is bounded on all sides by privately owned timberlands with the exception of the southwest corner where property is managed by the Bureau of Land Management (BLM) as part of the O & C Lands and the eastern edge where several corridors connect with National Forest lands. Most of the privately owned land has been roaded and clearcut earlier in the century. Much of the BLM land has been cutover within the last decade.

Forest Road 2611 penetrates the roadless area dividing it into two distinct segments joined by a one mile roadless neck at the north end where the proposed Hagan Research Natural Area is located.

Attractions Hikers climbing to the summit of Elk Mountain may be rewarded with with a scenic view of the surrounding mountains.

Capability

Manageability and Boundaries The boundaries described are easily identified and readily located on the ground. They have been compromised somewhat by the road corridor and thinning already mentioned. As of 1985, the Willamette National Forest was reviewing a proposed land exchange with the owners of two parcels of private land on the east edge of the roadless area (the Cone Creek and Simmons Creek parcels). Part of this land is unroaded and its acquisition would provide opportunities for dispersed nonmotorized recreation.

Natural Integrity Partial cut timber harvest along Forest Road 2611 corridor has occurred. This has caused a change in the spacing and variety of tree sizes present and a reduction in thermal cover due to reduced crown closure. The harvested area extends a quarter to a half mile from the edges of the road corridor. Plant species introduced to control erosion along roads have apparently not changed natural processes to any degree.

Slash treatment and fire control have changed the amount of woody debris and snag habitat available for small mammals and cavity nesting birds in and near the thinned area, while increased sunlight reaching the ground has accelerated the growth of brush and ground vegetation to some extent.

Natural Appearance Most of the area inventoried as unroaded has not been affected by human activity and is completely natural in appearance. The roadside segment which was harvested has been subjected to partial cut harvest only. While many visitors would note the stumps and changed spacing of the stand, most would accept it as natural appearing. Only the most knowledgeable would notice the changes in understory composition.

Opportunity for Solitude Mt. Hagan roadless area offers moderate opportunity for solitude. This is due to the screening effect of the dense natural vegetation and the steep broken nature of the terrain; although, this same characteristic can discourage visitors from cross country travel. Off site intrusions from highway noise is permanent. Smoke may be visible in the air for short periods of time.

Opportunity for Primitive Recreation The opportunity for this type of experience is moderate, due to its size and short distance to the core, which is less than 0.75 of a mile. However, the lack of developed recreation sites or a maintained trail system, as well as the challenge and moderate risk from steep, heavily wooded terrain provide opportunities for primitive recreation.

Special Features The area contains common features. Scattered findings of obsidian flakes indicate prehistoric use. No federally listed endangered or threatened species are known to be present.

The proposed Hagan Research Natural Area is located on the northern edge. It has been proposed to provide research opportunities for Douglas-fir (100-150 year age class) in the Western Cascades Province. This was identified as a high priority need in *Research Natural Area Needs in the Pacific Northwest*, USDA Forest Service General Technical Report PNW-38, 1975.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 4,275 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified.

Wildlife Resource The Mt. Hagan roadless area is used moderately by deer as winter range. Harvesting with proper design and size would probably improve forage conditions for big game. Developing late successional stands would increase the quality of old-growth for spotted owls. The eastern portion has previously been occupied by northern spotted owls.

Timber Resource The roadless area includes about 5,141 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir and true firs occupy the area representing about 228 million board feet. If stands are converted to a managed condition, biological potential yield

will be 720,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Water Resource The roadless area includes watersheds for Elk Creek and Cone Creek, both Class I streams, directly tributary to the McKenzie River, as well as Hagan Creek, a Class II stream, tributary to the South Fork of Gate Creek. There is no record of water developments or withdrawals in connection with these areas. Researchers from Oregon State University and the Pacific Northwest Forest and Range Experiment Station have several research projects underway or pending along Hagan Creek some of which are directly related to proposed timber sales currently planned.

Several land owners draw domestic water from Cone Creek.

Mineral and Energy Resource Current information does not indicate active mineral exploration or mining activity. Some prospecting occurred during the late 1800s while the Blue River mining district was active but no claims were developed. Mining potential is considered low.

Land Use Authorizations No special use authorizations are within the roadless area. Giustina Brothers Lumber Company has a Class "D" special use permit for a logging road (Gate Creek Road) which touches the northwest boundary.

Hagan Research Natural Area An establishment plan was developed and approved by the Forest Supervisor and Regional Forester: however, the Chief of the Forest Service has delayed approval pending review in the current forest planning process.

Cultural Resources Very Little is known about this area's potential for cultural resources. There is a limited amount of high probability ground due to the steep dissected slopes. The potential that does exist for prehistoric sites are on some of the broader ridge top and in the saddles.

Management Considerations

Fire Long-term fire history suggests that this area suffered several large catastrophic fires in the late 1800s and early 1900s resulting in the current forest of 80 to 120 year old Douglas-fir. More recent history indicates a scattered incidence of small lightning caused fires in the interior, as well as some minor roadside fires along the edges. Current fuel loadings are light, ranging from 20 to 45 tons per acre.

Need

Nearby Wilderness and Its Use The Mt. Hagan roadless area is within ten miles of the Three Sisters Wilderness (283,539 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 35 miles by highway to the east of Eugene, Oregon.

Interest by Proponents The Mt. Hagan roadless area generated a low amount of interest with 60% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Mt. Hagan roadless area. In Alternatives NC, K, A, J, and W, 60 to 88% of this area will be affected by road construction and timber harvest. Alternative L develops 24% and D develops 2% of the area. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in the developed portion of the area. Implementation of proposed management activities associated with Alternatives NC, K, A, J, and W alter the suitability of this area for future Wilderness consideration. Alternatives L and D maintain the option of future Wilderness consideration for this area. Figure C-21-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Mt. Hagan roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-21-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-21-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	4,266
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	747	747	747	1,130	1,152	1,109	747
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	1,152	1,152	1,152	1,152	--	171
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	171	171	171	171	171	171
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	4,906	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	384	--	341	384	--	597
Management Area **11d**	363	--	320	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	853
Management Area **11f**	--	--	--	--	--	--	21
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	21	21	21	21	21	21	21
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	5,162	4,351	3,711	3,327	3,263	85	85
15 Riparian [2]							
Management Area **15**	*	214	214	128	149	--	107

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-21-3. Mt. Hagan Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	4,266
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	219	--	209	450	493	1,374	--
	Acres	747	--	747	1,130	1,152	6,015	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	741	3,705	3,705	3,458	3,458	--	5,384
	Acres	363	1,920	1,813	1,813	1,856	171	1,920
Roaded Modified	RVDs	4,196	3,892	3,057	2,259	2,088	95	95
	Acres	5,183	4,373	3,733	3,349	3,285	107	107
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	747	1,322	2,069	2,453	2,474	6,186	4,607
Retention	Acres	--	--	--	--	--	--	875
Partial Retention	Acres	363	697	491	491	533	--	704
Modification	Acres	21	21	21	21	21	21	21
Maximum Modification	Acres	5,162	4,351	3,711	3,327	3,263	85	85
1st Decade								
Road Construction	Miles	--	4.2	4.2	9.3	4.2	1.3	1.1
Area Harvested	Acres	--	954	786	2,258	414	17	583
Programmed Timber Harvest	MBF	--	8,114	6,159	17,918	3,892	2,644	4,286
Area Remaining Undeveloped	%	--	54	62	100	97	99	72
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	4,181	4,053	3,178	3,242	3,242	85	426
75-94% of Full Yield	Acres	353	64	341	21	--	--	--
50-74% of Full Yield	Acres	--	128	128	107	--	--	853
30-49% of Full Yield	Acres	--	--	--	--	--	--	21

McLennen Mountain - 7,807 Acres

Description

History McLennen Mountain roadless area was studied in RARE I. The area was considered for Wilderness by the United States Congress. They released 8,873 acres for multiple-use management in the Oregon Wilderness Act of 1984. In the past, several local groups have strongly advocated Wilderness status for the McLennen Mountain roadless area. A number of planned timber sales have been appealed. In all cases the management decisions for the area have been upheld. Since the release of these lands in 1984, approximately 1,066 acres have been affected by development activities.

Location and Access Tps.16 and 17S., Rs.5 and 6E. The McLennen Mountain roadless area lies three miles south of McKenzie Bridge on the Blue River and McKenzie Ranger districts. Forest Road 1993 borders the area on the north, east, and south, and Forest Road 590 provides additional access to the south. Forest Trail 3529 along the northeastern border provides the only interior access.

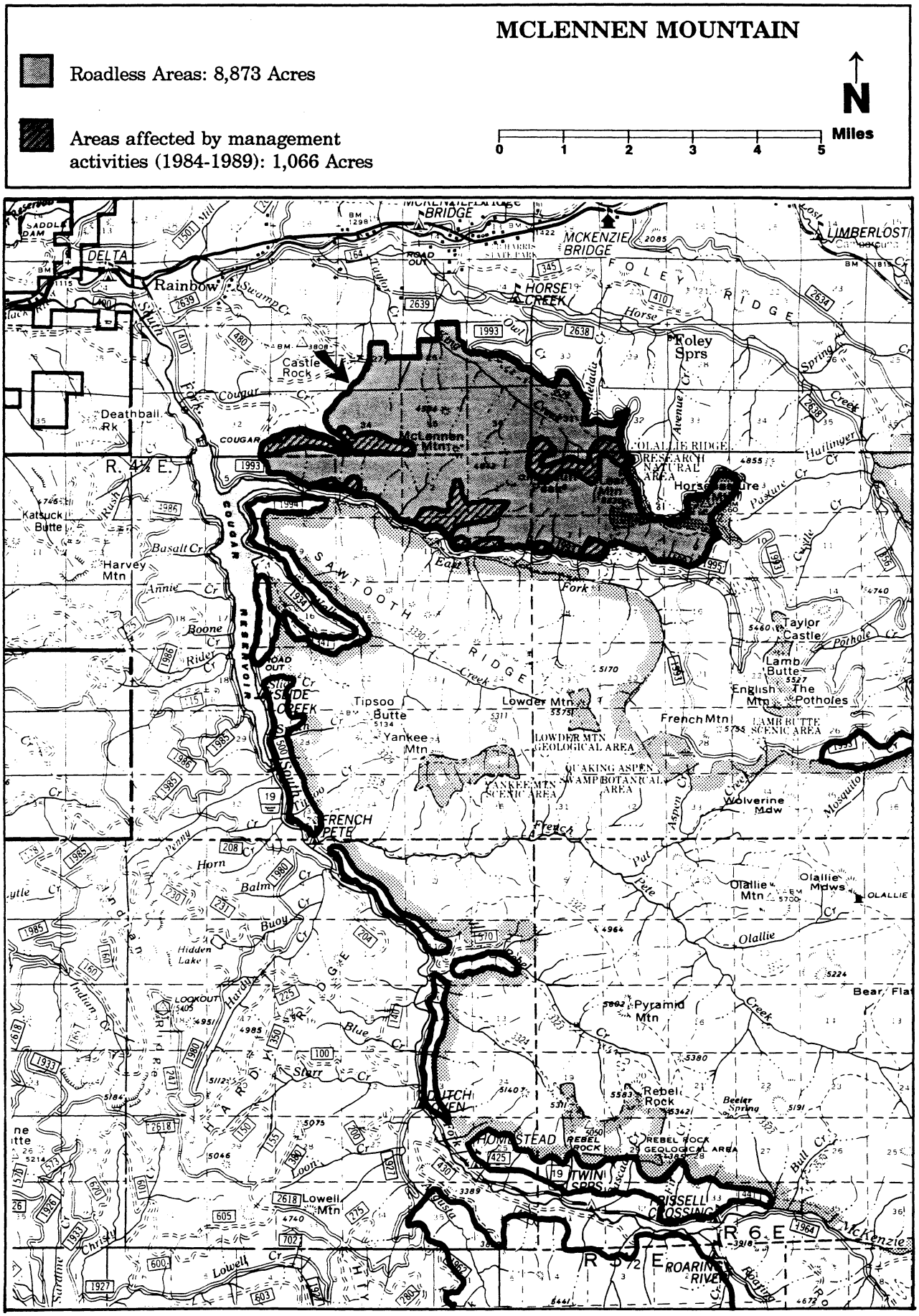
Geography and Topography Elevations range from 1,700 feet at the lower extremity of King Creek to over 5,000 feet on McLennen Mountain, O'Leary Mountain, and MacDuff Peak. These peaks and connecting ridges are situated in the central and eastern portions forming the backbone and headwaters for the remainder of the area. King Creek, Cougar Creek, and tributaries of the East Fork flow out of the area and ultimately into the McKenzie River. Topography varies from rock outcrops, talus slopes, and cliffs throughout the higher portions of the drainage to steep, deeply dissected side slopes.

Soil Soils are typically shallow at the upper elevations and moderately deep (20 to 40 inches) on the middle and lower slopes. There are about 5,439 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The area is heavily timbered with second growth and mature Douglas-fir on the north slopes with a transition to mountain hemlock and true firs at higher elevations. The upper elevations are characterized by open grass meadows, tag alder patches, and dying true firs resulting from balsam wooly aphid infestations.

Ecosystem Type There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-22-1


MCLENNEN MOUNTAIN
Roadless Areas: 8,873 Acres
Areas affected by management activities (1984-1989): 1,066 Acres
N
Miles
0 1 2 3 4 5
R. 4½ E.
R. 5½ E.
R. 6 E.
McLennen Mtn
Castle Rock
Deathball Rk
Katsuck Butte
Harvey Mtn
Rainbow
DELTA
BRIDGE
MCKENZIE BRIDGE
HORSE CREEK
Foley Sprs
FOLEY RIDGE
OLALLIE RIDGE RESEARCH NATURAL AREA
SAWTOOH RIDGE
Tipsoo Butte
Yankee Mtn
Lowder Mtn
LOWDER MTN GEOLOGICAL AREA
French Mtn
LAMB BUTTE SCENIC AREA
Taylor Castle
Lamb Butte
English Mtn
The Potholes
Wolverine Mdw
QUAKING ASPEN SWAMP BOTANICAL AREA
YANKEE MTN SCENIC AREA
FRENCH PETE
Olallie Mtn
Olallie Mdws
OLALLIE
Pyramid Mtn
Rebel Rock
REBEL ROCK GEOLOGICAL AREA
HOMESTEAD
TWIN SPRS
RUSSELL CROSSING
ROARING RIVER
Lowell Mtn
Hidden Lake
LOOKOUT
DUTCH OVEN
Bear Fla
Beeler Spring
Swamp Cr
Cougar Cr
Boone Cr
Annie Cr
Basalt Cr
Horn Cr
Balm Cr
Buoy Cr
Blue Cr
Starr Cr
Lowell Cr
Christy Cr
Horse Cr
Pat Cr
Olallie
Mosquito Creek
Pyramid Creek
Bull Cr
Reading Cr
McKenzie
Fork
Road Out
Ridge
Creek

Current Uses The 1977 Land Management Plan for the Willamette National Forest allocates most of the land to General Forest with special visual management corridors along major roads and trails. Recreation use is generally light and is usually day hiking with some occasional backpacking along the Ollalie Ridge and King Creek trails. A few hunters make use of the Castle Rock Saddle and short trails off existing road, but most do not hunt the steep dissected interior. As of 1985, three timber sales were active and two more were planned for the near future. The eastern edge includes the Ollalie Ridge Research Natural Area. Since this area was inventoried in 1984 management activities are estimated to have affected 1,200 acres of the area.

Appearance The appearance changes through three general landscape patterns as a visitor climbs toward the higher mountain ridges. At the lower elevations, the landscape has the appearance of a mature second growth forest. Trees are medium to large diameter, primarily Douglas-fir and to a lesser extent western hemlock. They are regularly spaced, with a closed canopy reducing the amount of sunlight reaching the ground. Patches of hardwoods such as maple and alder are scattered through the area where windstorms have created small openings in the canopy. Slopes are steep and broken by many small streams and draws. The ground is covered by salal, Oregon grape, rhododendron, and smaller trees of shade tolerant varieties. Numerous game trails lace the ridges and terrain breaks where movement is easiest.

As elevation increases, trees become smaller in size and more variety enters the stand which now includes more true fir and mountain hemlock. The terrain becomes steeper and broken with rock outcrops, and sharp spur ridges common. The canopy becomes more open, allowing sunlight to reach the ground. Surface vegetation changes with huckleberry and beargrass becoming the more common plants.

At the highest elevations trees are scarce, while ground cover is primarily beargrass, forbs, and dwarf huckleberry. Rocky meadows and tag alder shoots form the headwalls of the numerous small streams that flow from the sharp mountain ridgeline.

Surroundings The McLennen Mountain roadless area lies directly north of the French Pete addition to the Three Sisters Wilderness, separated by a narrow road corridor along East Fork Creek. Short spur roads have been built to access thinning harvest units. The forest is managed for timber production in General Forest on the remaining perimeter. Clearcuts and road development are common. New roads penetrate the area from the west and eastern edges.

Attractions The Ollalie Ridge Trail provides striking views of Sawtooth Ridge in the Three Sisters Wilderness and of the surrounding Willamette National Forest in general. It provides an opportunity for a relatively short day hike, with trailheads at the western and eastern termini. For a longer trip it is possible to pass through the Lamb Butte Scenic Area to the east and to cross Forest Road 1993 continuing into the Three Sisters Wilderness.

Capability

Manageability and Boundaries The boundaries are easily identified and readily located on the ground. New road construction and timber harvest have occurred within the boundary which may make management of the area more difficult for Wilderness.

Natural Integrity Timber harvest along the south and eastern edges and along the new roads into the heart of the area has changed the area's natural processes. Partial cutting and clearcutting have changed the canopy characteristics and variety of tree sizes present. Plant species have been introduced to the area for erosion control and wildlife habitat improvement. Plant and animal species dependent

on the closed canopy of large trees are reduced or eliminated in the harvested area, while other species preferring openings and earlier seral stages are increased. Slash treatment and fire control have changed the amount of woody debris and snag habitat available for small mammals and cavity nesting birds in and near the harvested units. Road cut and fill slopes contribute to increased erosion and sedimentation of downstream waterways, and block the normal migratory patterns of deer and elk.

Natural Appearance Roads and clearcut units are highly intrusive in appearance and are obvious to even the most casual observer in the immediate area. They will be especially visible due to their location adjacent to the major travel route, Ollalie Ridge Trail.

Opportunity for Solitude The area offers low opportunity for solitude. Logging roads penetrate into the interior of the area as well as almost surrounding it. Off site intrusions of sight and sound are permanent with heavily used roads like 1993. The size of the area is relatively small, also. These may be offset somewhat by the screening effect of the dense natural vegetation and steep broken nature of the terrain although this same characteristic can discourage visitors from leaving the established trail system. Opportunities for cross country travel are limited. The distance from the perimeter to the approximate geographic center is from one to 1.5 miles. If the boundary is adjusted to exclude the newly roaded area the distance would be about 0.5 mile, and the area would be reduced to 6,500 acres.

Opportunity for Primitive Recreation The opportunity for this type of experience is relatively high. This is due mainly to the lack of well developed recreation sites, the low standard trail system currently in place, the challenge of moderate risk from steep rocky terrain, and the chance of rockslides and debris avalanches.

Special Features Features are common. Scattered findings of obsidian flakes indicate prehistoric use. No federally listed endangered or threatened species are known to be present.

The Ollalie Ridge Trail provides an opportunity for identifying a wide variety of native plants. The trail is occasionally used in conjunction with the nearby East Fork Creek Trail as a field study area by classes from nearby schools and by members of native plant clubs.

The Ollalie Ridge Research Natural Area is located at the eastern edge providing ongoing research opportunities in the mountain meadow and true fir/mountain hemlock plant communities of Oregon's Western Cascade Mountains.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 5,066 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. Potential developed recreation sites have been identified.

Wildlife Resource At least two separate elk herds totaling approximately 35 animals utilize the lower elevations during the winter months. A smaller number of elk utilize ridge lines as travel corridors in the summer months. Location of harvest units with proper forage and cover would probably increase deer and elk populations. However, removal of old-growth stands will gradually reduce habitat for old-growth dependent species. A management regime focused on developing late successional stands would improve the quality of habitat for species such as the spotted owl. A small portion of the area borders Cougar Reservoir. Developing older aged stands would improve nesting and roosting habitat for bald eagles which require trees with large platform branches and some dead tops.

Timber Resource The roadless area includes about 5,354 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 239 million board feet. If stands are converted to a managed condition, biological potential yield will be 735,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Water Resource Cougar Creek has been identified as a cold water source for a fisheries enhancement project associated with the proposed Strube Dam Project.

Land Use Authorizations The extreme southwestern edge is included in a Flood Control Withdrawal established in 1959 as part of the Cougar Dam Project. Ollalie Ridge Research Natural Area was established by the authority of the Chief of the Forest Service in 1963. This 657 acre area is dedicated to long-term research needs.

Mineral Resources Some prospecting was done during the late 1800s while the Blue River mining district was active but no claims were developed. Geothermal exploration was conducted by the State of Oregon, Department of Geology and Mineral Industries, in 1980 and 1981 including test drilling adjacent to Road Forest 1993 at the south edge. Results of the tests are not available at this time.

Management Considerations

Fire Long-term fire history suggests that this area suffered several large catastrophic fires in the late 1800s and early 1900s resulting in the current forest of 70 to 120 year old Douglas-fir. More recent history indicates a scattered incidence of small lightning caused fires in the interior as well as some minor roadside fires along the edges. Current fuel loadings range from 20 to 45 tons per acre.

Need

Nearby Wilderness and Its Use The McLennen Mountain roadless area is adjacent to the the Three Sisters Wilderness (189,346 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 40 miles by highway to the east of Eugene, Oregon.

Interest by Proponents The McLennen Mountain roadless area generated a moderate amount of interest with 57% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the McLennen Mountain roadless area. In Alternatives NC, K, A, J, and W, 80 to 92% of this area will be affected by road construction and timber harvest. Alternative D will develop 50% of the area and Alternative L will develop 18%. As a result of this development, uses dependent on roadless conditions-- such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives will alter the suitability of this area for future Wilderness consideration. Alternative L and D maintains the option of future Wilderness consideration for most of this area. Figure C-22-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the McLennen Mountain roadless area, an array of goods and services are provided. Emphasis on priced commodities such as

wood products are provided in Alternatives NC, K, A, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-22-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-22-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	597	597	597	597	597	597	597
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	5,503
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	875	875	875	875	21	235
Management Area **9b**	--	128	128	128	128	107	21
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	128	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	3,008	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	256	--	2,517	2,688	299	--
Management Area **11b**	--	213	--	--	--	--	--
Management Area **11c**	--	--	--	256	320	2.346	576
Management Area **11d**	1,024	213	1,024	1,003	363	--	--
Management Area **11e**	2,112	1,898	1,557	1,642	2,197	427	213
Management Area **11f**	512	213	448	555	341	768	576
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	3,541	3,306	3,072	149	128	--	--
15 Riparian [2]							
Management Area **15**	*	85	85	64	149	107	64

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-22-3. McLennen Mt. Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	282	282	282	282	282	725	282
	Acres	597	597	597	597	597	3,605	597
Semiprimitive Motorized	RVDs	--	--	--	--	--	221	--
	Acres	--	--	--	--	--	128	--
Roaded Natural	RVDs	9,977	6,174	10,224	9,977	9,780	5,779	11,904
	Acres	3,669	3,434	4,138	4,543	4,394	3,775	7,210
Roaded Modified	RVDs	778	2,355	684	778	892	380	--
	Acres	3,541	3,775	3,072	2,666	2,816	299	--
Trails								
Existing Trails								
Full Protection Level	Miles	6.0	7.0	7.0	7.0	2.0	8.0	10.0
Moderate Protection Level	Miles	3.0	2.0	3.0	3.0	8.0	0.0	0.0
Low Protection Level	Miles	3.0	3.0	2.0	3.0	1.0	3.0	1.0
Potential Trails								
Full Protection Level	Miles	--	--	--	--	0.0	1.0	0.0
Moderate Protection Level	Miles	1.0	0.0	1.0	1.0	0.0	--	0.0
Low Protection Level	Miles	--	0.0	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	597	1.600	1,600	1,600	1,600	3,733	6,356
Retention	Acres	2,624	2,112	2,005	2,197	2,538	1,322	789
Partial Retention	Acres	1,045	320	1,130	1,344	853	2,453	661
Modification	Acres	--	469	--	2,517	2,688	299	--
Maximum Modification	Acres	3,541	3,306	3,072	149	128	--	--
1st Decade								
Road Construction	Miles	--	5.0	4.0	8.0	5.0	2.0	0.6
Area Harvested	Acres	--	800	817	1,572	783	579	55
Programmed Timber Harvest	MBF	--	6,952	6,772	14,116	7,095	3,972	401
Area Remaining Undeveloped	%	--	68	68	38	69	77	98
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	2,816	2,837	2,368	2,304	2,171	2,027	320
75-94% of Full Yield	Acres	2,304	1,472	1,898	1,898	1,877	149	--
50-74% of Full Yield	Acres	213	128	171	235	213	640	213
30-49% of Full Yield	Acres	--	--	--	--	--	--	234

Chucksney Mountain - 15,507 Acres

Description

History The Chucksney Mountain roadless area was considered for Wilderness by the United States Congress. They released 16,211 acres for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 704 acres have been affected by development activities.

Location and Access T.19S., Rs.5 and 5½E. The Chucksney Mountain roadless area is located 20 miles southeast of Blue River on the Blue River and Oakridge Ranger Districts. The area lies north and east of Forest Highway 19 (Aufterheide Drive) with Forest Road 1942 forming a portion of the southern boundary. Forest Roads 1962, 1929, 1929280, and 1940757 provide access from the west, and Forest Roads 19430 and 19431 from the north. Forest Trails 3560 and 3314 provide some access to the interior.

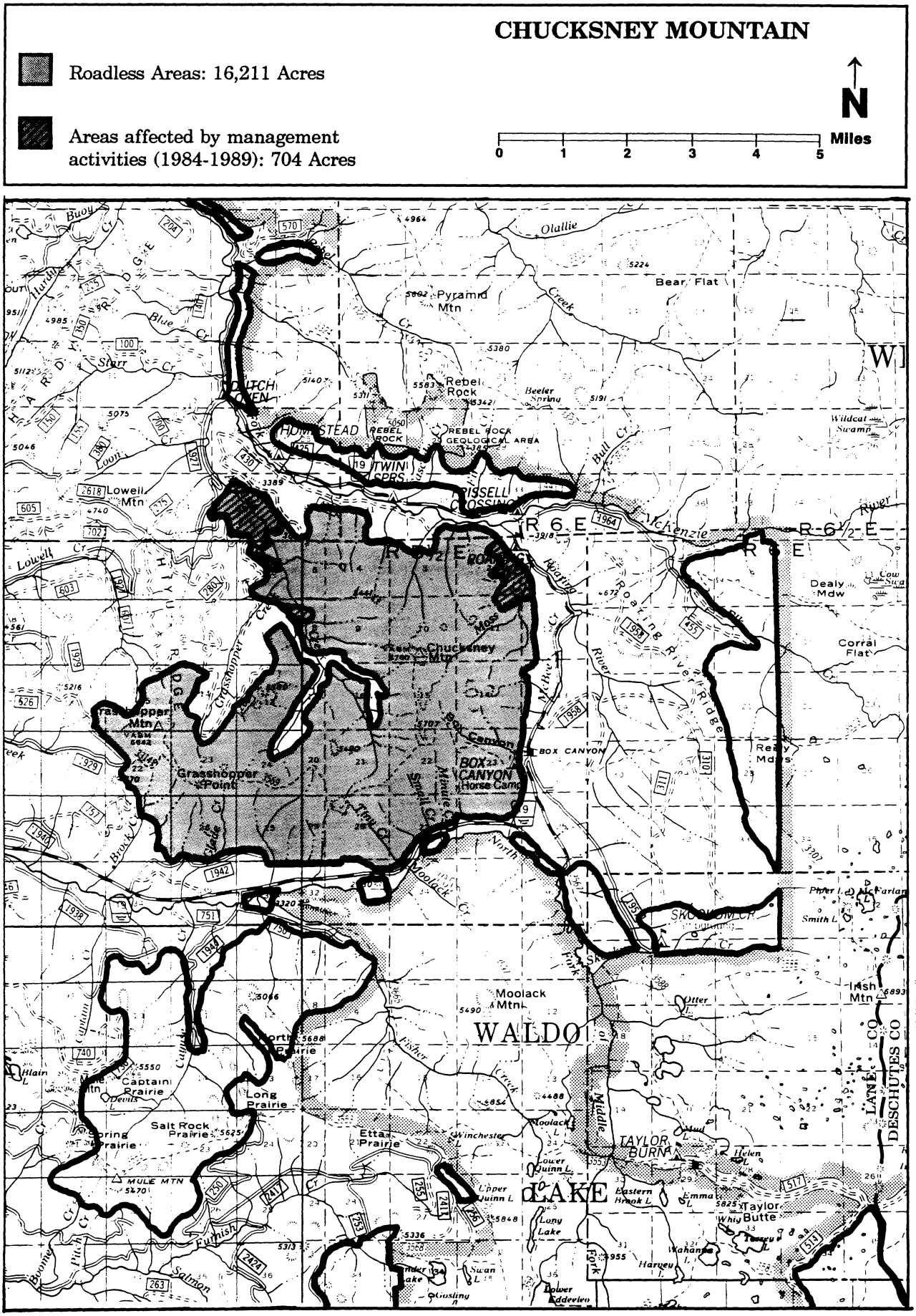
Geography and Topography The main topographical feature of the area is the ridge connecting Chucksney and Grasshopper Mountains. The highest elevation is 5,760 feet at Chucksney Mountain. The upper slopes are steep and rocky.

Soil The upper slopes contain erosive soil conditions and lower slopes are gentle with moderately deep soils. There are about 7,316 acres that have potential for severe surface erosion; and approximately 576 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation At the lower elevation vegetation is mature second growth forest, with numerous patches of old-growth Douglas-fir. Trees are medium to large diameter, primarily Douglas-fir and to a lesser extent western hemlock. They are evenly spaced. Patches of hardwoods such as maple and alder are scattered through the intermediate canopy. The ground is covered by salal, Oregon grape, rhododendron, and smaller trees of shade tolerant species. As elevation increases, trees become smaller in size. More variety enters the stand which includes true fir and mountain hemlock. Huckleberry and beargrass become the dominant understory plants. At the highest elevations, trees are small spruce, subalpine fir, and lodgepole pine. Ground cover is primarily beargrass, forbs, and dwarf huckleberry. Several extensive meadows occur with many varieties of forbs.

Ecosystem Type There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-23-1


CHUCKSNEY MOUNTAIN
Roadless Areas: 16,211 Acres
Areas affected by management activities (1984-1989): 704 Acres
N
0 1 2 3 4 5 Miles
Olallie
Bear Flat
Pyramid Mtn
Rebel Rock
REBEL ROCK GEOLOGICAL AREA
HOMESTEAD
TWIN SPRS
PISSELL CROSSING
Lowell Mtn
Chucksney Mtn
Grasshopper Mtn
Grasshopper Point
BOX CANYON
Horse Camp
Moolack Mtn
WALDO LAKE
Captain Prairie
Long Prairie
Salt Rock Prairie
Etta Prairie
Spring Prairie
MULE MTN
TAYLOR BURN
Taylor Butte
Irish Mtn
Dealy Mdw
Corral Flat
Reedy Mdws
Wildcat Swamp
Smith L
Otter L
Upper Quinn L
Lower Quinn L
Long Lake
Swan L
Harvey L
Lower Odderwin
Fisher Creek
Middle Fork
North Fork
Roaring River
McKenzie River
Lowell Cr
Blue Cr
Starr Cr
Loon Cr
Bull Cr
Grasshopper Cr
Moolack Cr
Fuji Cr
Salmon
LANE CO
DESCHUTES CO
R 6 E
R 6½ E
R 7 E

Current Uses The present allocation from the 1977 Forest Land Management Plan is Undeveloped Roadless Recreation and General Forest. Recreation use is generally moderate consisting of some backpacking along the Hi Yu Ridge and Chucksney Mountain Trails. This backpacking is usually done by elk hunters with trail stock. Horse use is expected to increase in the near future with construction of the Box Canyon Horse Camp and trail head complete at the southeast edge. As of 1985, two timber sales were active within the area: South Frissel on the extreme northeast corner and Locust adjacent to a narrow road corridor penetrating the western side. Several more sales were proposed, for the General Forest portion. Since this area was inventoried in 1984 management activities are estimated to have affected 640 acres of the area.

Appearance The appearance changes through three general landscape patterns as a visitor climbs toward the higher mountain ridges. At the lower elevations, the landscape has the appearance of a mature second growth forest with numerous patches of old-growth Douglas-fir. Trees are medium to large diameter, primarily Douglas-fir and to a lesser extent western hemlock. They are evenly spaced with a closed canopy reducing the amount of sunlight reaching the ground. Patches of hardwoods such as maple and alder are scattered through the area where natural events have created small openings in the canopy. Slopes are steep and broken by many small streams and draws. The ground is covered by salal, Oregon grape, rhododendron, and smaller trees of shade tolerant species. Numerous game trails lace the ridges and terrain breaks where movement is easier.

As elevation increases trees become smaller in size. More variety enters the stand which includes true fir and mountain hemlock. The terrain becomes steeper and broken with rock outcrops, and sharp spur ridges. Large cliffs and talus slopes are common, especially, along the southern slopes of the current Unroaded Recreation Area. The canopy becomes more open, allowing sunlight to reach the ground. Understory vegetation changes to huckleberry and beargrass. At the highest elevations trees are small spruce, subalpine fir, and lodgepole pine. Ground cover is primarily beargrass, forbs, and dwarf huckleberry. Several extensive meadows are the dominant feature of the landscape.

Surroundings The Chucksney Mountain roadless area lies south and west of the French Pete Addition to the Three Sisters Wilderness, separated by the South Fork of the McKenzie River and the Aufterheide Scenic Drive. It is north and west of the Waldo Lake Wilderness and an addition to the Three Sisters Wilderness south of Skookum Lake.

Attractions The Hi Yu Ridge and Chucksney Mountain Trails provide striking views of the Three Sisters and Waldo Lake Wilderness and of the surrounding Willamette National Forest in general. The high meadows are popular destinations for both hikers and trail horse riders. Aufterheide Drive is a popular drive for sightseers and others.

Capability

Manageability and Boundaries The boundaries described are easily identified and readily located on the ground. Nonconforming uses such as roads surround the roadless area. These uses provide opportunity for accessing the area and minor intrusions by people.

Natural Integrity Impacts on the natural integrity are low and localized to very small areas. There are roads and units from logging operations, soil compaction, soil erosion, human made structures, and spring development at a horse camp, unnatural openings for helispots, compaction on trails, a cabin, garbage, compaction and loss of ground cover on dispersed campsites, grazing, and interruption of natural fire events.

Natural Appearance With the exception of the roaded intrusion the area maintains a natural appearance. Since the major trail systems avoid the road location, the roadless area appears to be natural to most visitors but some impacts (sight, sound, or smell) are apparent.

Opportunity for Solitude The Chucksney Mountain roadless area offers low opportunity for solitude because of its size, proximity to roads, and managed forest. This may be offset somewhat by the screening effect of the dense natural vegetation and the steep broken nature of the terrain. This same characteristic can discourage visitors from leaving the established trail system. Opportunities for cross country travel are limited. The distance from the perimeter to the approximate geographic center is from two to 2.5 miles. Offsite intrusions are perceptible, but relatively distant and generally not permanent. Some off site intrusions are close by, but generally not permanent.

Opportunity for Primitive Recreation The opportunity for this type of experience is relatively high due to the lack of developed recreation sites, the challenge of moderate risk from steep rocky terrain, and the chance of rockslides and debris avalanches. The area provides opportunities for trail rides throughout the summer, packing in with horses for the fall hunting season, backpacking, and camping.

Special Features Features are common. Isolated finds of obsidian flakes indicate prehistoric use; however, both prehistoric and historic sites have been identified. It has been suggested that the high meadows were periodically burned by Native Americans to improve wildlife habitat and huckleberry production.

No federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 9,349 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. Potential developed recreation sites have been identified.

Wildlife Resource Considerable big-game winter use occurs on south facing benches up slope of the North Fork of the Middle Fork of the Willamette River. During the summer at least two elk herds, numbering 75 to 100 animals, utilize the meadow/ridgeline complex of Grasshopper Mountain. Forage/cover ratios at higher elevations favor cover. Timber harvest could help balance the ratios, but topography is so steep that forage utilization would likely be limited. Judicious harvest of older stands at lower elevations would probably improve big-game conditions, but would also reduce habitat for old-growth dependent species. A management system designed to develop late successional stands would benefit old-growth dependent species, but would probably preclude expansion of big-game herds to their highest potential.

Timber Resource The roadless area includes about 9,087 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 351 million board feet. If stands are converted to a managed condition, biological potential yield will be 1,151,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resources There is a high probability that numerous undiscovered prehistoric sites exist within the area due to the areas high suitability as a summer upland hunting, camping, and gathering

location. It is also likely that historic sites exist based on the high use of the area for summer grazing of cattle and sheep during the early part of the century.

Management Considerations

Fire Long-term fire history suggests that this area suffered several large catastrophic fires in the late 1800s and early 1900s resulting in the current stands of 70 to 120 year old Douglas-fir mixed with remnant stands of old-growth and mixed age timber. More recent history indicates a scattered incidence of small lightning caused fires in the interior as well as some minor roadside fires along the edges. Present suppression policies have been highly successful at limiting the size of wildfire. This may be responsible for encroachment of conifer forest types into the high meadows. Fuel loadings range from 20 to 45 tons per acre.

Insects and Disease The area is typical of second growth Douglas-fir types. Some incidence of bark beetle and a major infestation of root rot, *Phellinus weirii*, have been noticed in the northeast corner. The South Frissel Timber Sale is intended to convert this area to a less susceptible timber type and limit the further spread of the disease.

Need

Nearby Wilderness and Its Use The Waldo Lake Wilderness (37,157 acres) is just across the road to the south of the Chucksney Mountain. It is also within one mile of the Three Sisters Wilderness (283,539 acres) on the north edge of the roadless area. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 65 miles by highway to the east of Eugene, Oregon.

Interest by Proponents The Chucksney Mountain roadless area generated a low amount of interest with 50% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Chucksney Mountain roadless area. In Alternatives NC, D, A, J, and W, 29 to 40% of this area will be affected by road construction and timber harvest. Alternative K will develop 86% of the area and L will develop 9%. As a result of this development, uses dependent on roadless conditions--such as semiprimitive recreation--will not be provided in portions of the area. Implementation of proposed management activities associated with Alternatives K would alter the suitability of this area for future Wilderness consideration. Alternative L maintains the option of future Wilderness consideration for most of this area. Figure C-23-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Chucksney Mountain roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternative K. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives NC, K, A, J, D, and W. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-23-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-23-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	13,139
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	277	277	277	192	171	277	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	192
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	1,194	1,024	939	939	768	341
Management Area **9b**	--	43	43	21	43	--	--
Management Area **9c**	--	171	43	43	107	--	--
Management Area **9d**	--	--	--	--	192	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	9,087	--	9,087	9,492	9,364	11,987	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	2,112	2,069	--	--
Management Area **11b**	--	192	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	832	427
Management Area **11d**	704	--	597	448	299	--	--
Management Area **11e**	--	--	--	--	--	--	491
Management Area **11f**	--	--	--	--	--	--	512
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	5,418	13,161	4,245	2,112	2,133	1,493	--
15 Riparian [2]							
Management Area **15**	*	448	170	128	171	128	107

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-23-3. Chucksney Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	13,139
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	2,936	--	2,936	2,932	2,986	3,897	--
	Acres	9,087	--	9,087	9,492	9,364	11,987	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	8,447	9,336	10,842	9,682	9,953	13,758	13,806
	Acres	1,003	2,154	2,176	1,792	1,941	2,026	2,368
Roaded Modified	RVDs	7,840	19,402	6,910	7,404	7,043	2,031	--
	Acres	5,418	13,353	4,245	4,223	4,202	1,493	--
Trails								
Existing Trails								
Full Protection Level	Miles	16.0	10.0	16.0	16.0	16.0	17.0	17.0
Moderate Protection Level	Miles	1.0	1.0	1.0	1.0	2.0	--	0.0
Low Protection Level	Miles	1.0	8.0	1.0	1.0	--	--	0.0
Potential Trails								
Full Protection Level	Miles	7.0	4.0	7.0	7.0	8.0-	8.0	8.0
Moderate Protection Level	Miles	1.0	--	1.0	1.0	--	--	--
Low Protection Level	Miles	1.0	4.0	1.0	1.0	--	--	--
Visual Quality Objectives								
Preservation	Acres	9,087	1,408	1,493	10,494	10,452	12,755	13,673
Retention	Acres	277	277	405	192	363	277	1,280
Partial Retention	Acres	725	469	597	597	491	981	555
Modification	Acres	--	192	--	2,112	2,069	--	--
Maximum Modification	Acres	5,418	13,161	4,245	2,112	2,133	1,493	--
1st Decade								
Road Construction	Miles	--	7.0	3.2	4.5	3.2	2.5	2.0
Area Harvested	Acres	--	1,129	790	861	472	603	73
Programmed Timber Harvest	MBF	--	9,493	6,350	7,576	4,095	4,324	311
Area Remaining Undeveloped	%	--	77	84	83	91	88	98
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	3,839	7,060	2,880	2,965	2,986	1,941	235
75-94% of Full Yield	Acres	683	448	661	277	64	256	--
50-74% of Full Yield	Acres	256	405	341	277	192	320	768
30-49% of Full Yield	Acres	--	--	--	--	--	--	299

Waldo-Lake - 9,705 Acres

Description

History The Waldo-Lake roadless area is a parcel of much greater area called the Waldo Lake roadless area. To reduce confusion in describing the area, the descriptions of the 44,857 acres of Waldo roadless area was divided into six parcels: Fuji, Salmon Creek, Many Prairies, Koch, Moolack, and Lake. Waldo Lake roadless area was included in both RARE I and RARE II. The original 89,590 acres of roadless area was considered for Wilderness by the United States Congress. They released 44,857 acres for multiple-use management and designated 37,157 acres as Waldo Lake Wilderness, and designated 7,577 to be added to the Three Sisters Wilderness in the Oregon Wilderness Act of 1984. This area now includes only Waldo Lake and a strip of lake shore.

Location and Access This area is included in portions of T.21S., Rs.5½ and 6E., and T.22S., Rs.5 ½ and 6E., in Lane County within the Oakridge Ranger District and approximately 24 miles east of the town of Oakridge. It is accessed by Forest Service Road 5897 from the east and numerous trails from the south, west, and north.

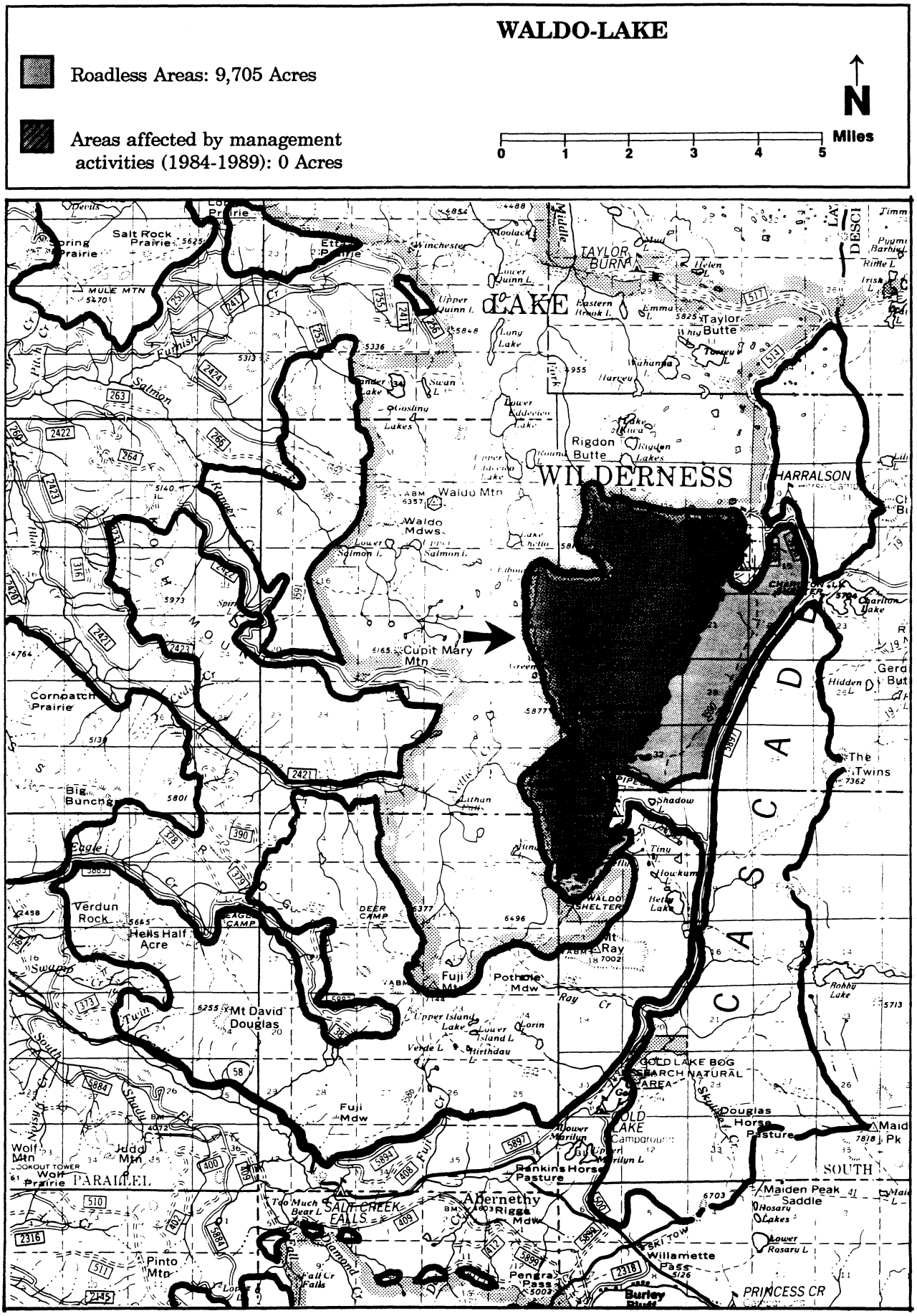
Geography and Topography The area is dominated by Waldo Lake which occupies 6,040 acres. The lake was formed by volcanic processes and modified by glaciation. The remainder of the area consists of a generally narrow strip of shoreline with flat to rolling topography. No permanent streams flow into the lake and the shoreline is moderately convoluted. Elevations range from 5,414 (Waldo Lake surface elevation) to 5,850 feet above sea level.

Soil Soil along the lake shore is generally shallow and derived from glacial materials overlaid by pumice deposits from Mt. Mazama. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetation consists mostly of true fir/mountain hemlock forests that also contain a considerable amount of lodgepole pine and western white pine. There are many small wet meadows along the lake shore, and one large meadow at the south end of the lake.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/Hemlock (*Abies-Tsuga*) forest (004).

Figure C-24-1


WALDO-LAKE
Roadless Areas: 9,705 Acres
Areas affected by management activities (1984-1989): 0 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
LAKE
TAYLOR BURN
Waldo Mtn
Cupit Mary Mtn
Rigdon Butte
Taylor Butte
HARRALSON
Waldo Mdws
Salt Rock Prairie
Cornpatch Prairie
Big Bunch
Verdun Rock
Hells Half Acre
Mt David Douglas
Fuji Mtn
Fuji Mdw
Pothole Mdw
Mt Ray
The Twins
Shadow
Tiny
Hoakum
Helen Lake
Rahhy Lake
GOLD LAKE BOG RESEARCH NATURAL AREA
GOLD LAKE Campground
Douglas Horse Pasture
Maiden Peak
Maiden Peak Saddle
SOUTH
Rankins Horse Pasture
Abernethy
Riggs Mdw
SALT CREEK FALLS
Too Much Bear L
Diamond Cr
Pinto Mtn
Wolf Mtn
Judd Mtn
PARAILEL
Willamette Pass
Penegra Pass
Burley Butte
PRINCESS CR
DEER CAMP
EAGLE CAMP
WALDO SHELTER
Upper Island Lake
Lower Island L
Verde L
Birthday L
Lower Marilyn
Upper Marilyn L
Lower Rosaru L
Rosaru Lakes
Gosling Lakes
Lower Salmon L
Upper Salmon L
Lower Quinn L
Upper Quinn L
Winchester L
Moolack L
Eastern Hawk L
Long Lake
Swan L
Lower Rigdon Lake
Rigdon Lakes
Harkey L
Kahanna L
Emma L
Helen L
Rattle L
Irish L
Timm
Pygmy Barrier
Carlton Lake
Hidden L
Lithan
Tipsoo
Ski Tow
CASCADE
SOUTH FORK MCKENZIE R
Swamp Cr
Twin Cr
Ray Cr
Fuji Cr
Furnish Cr
Salmon Cr
Rainer Cr
Lillick Cr
Cedar Cr
Eagle Cr
Shadow Cr
Skookum Cr
Horse Cr
Nash Cr
Shady Pt
Wolf Mtn LOOKOUT TOWER

Current Uses Management direction (FLMP 1977) provides for motorized and nonmotorized recreational use. Waldo Lake receives low to moderate boating use, usually associated with camping activities in the three campgrounds adjacent to the lake. Some hiking occurs on the trail that circles the lake. Some fishing also occurs, but the lake does not provide a rich fisheries resource.

Appearance Waldo Lake is one of the purest and clearest lakes in the world. Its large size embodies over 6,000 acres surrounded by evergreen forest. The distance of the far peaks in the background illustrate its size from serene viewpoints around the lake shore.

Surroundings The Waldo-Lake roadless area is bordered on the south and west sides by the Waldo Lake Wilderness, and on the north by the Three Sisters Wilderness. On the east, it is separated from the Maiden Peak roadless area by Forest Road 5897.

Attractions The clear water of Waldo Lake is the main attraction. The shoreline is easily accessible for canoes and boats. The afternoon winds fill the sails of wind propelled boats and boards. Campgrounds and easy to walk trails invite many visitors to the lake basin. The lake provides boating opportunities as well as panoramic views of the surrounding volcanic peaks.

Capability

Manageability and Boundaries The eastern boundary is located along adjacent nonconforming uses. This would make this area relatively hard to manage as Wilderness and maintain its primitive character. Sights and sounds of civilization in the narrow road corridor and developed campgrounds will be easily detected. The road provides good access to the eastern boundaries of the area.

Natural Integrity There are a number of small management developments consisting of approximately 25 miles of hiking trails, water control structures, and recreational structures associated with campgrounds.

There is a developed campground on Rhododendron Island which contains pit toilets, fire rings and picnic tables, and exhibits some evidence of soil compaction and vegetation damage. Boat ramps extend into the lake from the three adjacent highly developed campgrounds, and there are several benches in the vicinity of the campgrounds. An underground water line exists from Charlton Lake to Islet Campground. Motor boat use is currently permitted on Waldo Lake and some very limited and local water pollution from engine fuel and oil can be seen on occasion. There is also a primitive wooden shelter of historic value near the meadow at the south end of the lake.

There is a U.S. Geological Survey (USGS) stream gauging station at the outlet of the lake in its northwest corner. The original outlet channel was bypassed through excavation of the existing channel. At Klovdahl Bay there is a diversion tunnel with dam, that has been plugged, which once drained the lake into the Black Creek drainage to the west.

This tunnel consists of a massive cement and steel structure with a moderate amount of associated excavation. Neither of these water control features have much, if any, effect upon the integrity of the natural systems, since the tunnel is no longer a functional diversion structure, but they both present intrusive features into an otherwise natural environment.

Natural Appearance Aside from the localized development structures, the Waldo-Lake roadless area appears very natural to both the casual and informed observer.

Opportunities for Solitude Due to the long sight distance when on the lake, this area does not provide good opportunities for solitude, but there are many small bays that boaters can enter to experience a feeling of isolation. The forested margin provides excellent opportunities for solitude due to the screening effect of the vegetation, and to a lesser extent, the topography.

Opportunities for Primitive Recreation Waldo Lake provides excellent opportunities for human or wind powered boating, hiking, and fishing. It also provides photographic opportunities.

Challenging Experience The size of Waldo Lake provides a challenge for boating experiences, especially during stormy weather.

Special Features Scientists from Oregon and California universities have used the lake periodically for limnological (fresh water lake) studies. There is considerable history associated with Waldo Lake. The Klovdahl Tunnel and Hydroelectric Project and Waldo Lake access which was a primitive dirt road until 1967 when the Waldo Road was put in, have been long standing items of interest.

Availability

Resource Potentials

Water Resource A water system for Shadow Bay Campground is located at the end of Forest Road 504. This system pumps water out of Waldo Lake for campground use. A water gauging station is located at the head of the North Fork of the Middle Fork of the Willamette River, near Dam Camp, which is used by the U.S. Soil Conservation Service to measure the flow out of Waldo Lake.

Livestock Resource There is no potential for domestic livestock use, but good potential for recreation stock use.

Timber Resource The roadless area includes about 3,370 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 98 million board feet. If stands are converted to a managed condition, biological potential yield will be 273,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Wildlife Resource The Waldo-Lake roadless area provides light to moderate summer range use for big game animals. Wolverine use is likely during the winter. The area encompasses nearly 3 miles of Waldo Lake's east shoreline, consequently any management activities could have a significant impact on water and fishing values. Most big game forage is associated with scattered root-rot pockets, and forage-cover ratios could be improved by timber harvest.

Recreation Resource Capacity estimates indicate that this area could provide 6,868 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trail locations and developed recreation sites have been identified.

Cultural Resources The Waldo-Lake roadless area contains a large share of ground that could be classed as high potential for artifacts and sites. There is abundant water in most locations combined with a variety of upland food resources such as huckleberries, pond lilies (wocus), seeds, and game. This was likely a major resource catchment area during the summer and fall for many prehistoric people.

Only a small portion has been surveyed in the western portion of the Waldo roadless area. Four basic types of cultural resources have been derived: 1) Upland prehistoric Native American lithic scatters along ridges and in saddles; 2) lithic scatters and "campsites" adjacent to lakes and springs; 3) historic sheepherding camps, trapping camps, and cabins; and 4) historic USDA Forest Service guard stations, shelters, and petroglyphs.

Management Considerations

Insect and Disease Laminated root rot, *Phellinus weirii*, is prevalent throughout the area.

Need

Nearby Wilderness and Its Use The Waldo-Lake roadless area is adjacent to the Waldo Lake Wilderness (37,157 acres); 7 miles north of the Diamond Peak Wilderness (53,773 acres); and 7 miles south of the Three Sisters Wilderness (283,539 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 60 miles by highway to the southeast of Eugene, Oregon.

Interest by Proponents The Waldo Lake roadless area generated a high amount of interest with 71% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Waldo-Lake roadless area. In Alternative K, 13% of the land area will be affected by road construction and timber harvest. On the remaining alternatives less than 1% will developed. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided the area. Portions of this area contiguous to the Waldo Lake Wilderness in Alternative K will remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. All other Alternatives maintain the option of future Wilderness consideration for this area. Figure C-24-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Waldo-Lake roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-24-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-24-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	9,684
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	64	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	6,164	8,445	6,164	6,143	--	--	--
Management Area **10c**	--	--	--	747	7,060	6,911	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	3,455	--	3,455	2,730	2,560	2,709	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	1,216	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	43	43	43	43	43	43	43
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	21	21	21	21	21	21	43
Management Area **13b**	21	21	21	21	21	21	--
14 General Forest							
Management Area **14a**	--	--	--	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-24-3. Waldo-Lake Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	9,620
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	4,089	50	4,089	3,222	3,003	3,197	--
	Acres	3,519	64	3,519	2,773	2,602	2,752	--
Semiprimitive Motorized	RVDs	7,381	14,138	7,381	9,612	10,176	9,677	--
	Acres	6,100	8,361	6,100	6,847	7,039	6,868	--
Roaded Natural	RVDs	420	14,103	420	420	247	420	420
	Acres	43	1,237	43	43	21	43	43
Roaded Modified	RVDs	190	190	190	190	190	190	190
	Acres	43	43	43	43	43	43	43
Trails								
Existing Trails								
Full Protection Level	Miles	9.0	2.0	9.0	9.0	9.0	9.0	9.0
Moderate Protection Level	Miles	--	8.0	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	6.0	0.0	6.0	6.0	6.0	6.0	6.0
Moderate Protection Level	Miles	--	6.0	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	3,519	64	3,519	2,773	2,602	2,752	9,620
Retention	Acres	--	1,216	--	747	7,039	6,868	--
Partial Retention	Acres	6,143	8,383	6,143	6,143	21	43	43
Modification	Acres	43	43	43	43	43	43	43
Maximum Modification	Acres	--	--	--	--	--	--	--
1st Decade								
Road Construction	Miles	--	2.0	--	--	--	--	--
Area Harvested	Acres	--	351	--	--	--	--	--
Programmed Timber Harvest	MBF	--	2,659	--	--	--	--	--
Area Remaining Undeveloped	%	--	89	--	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	--	--	--	--	--	--	--
75-94% of Full Yield	Acres	--	2,154	--	--	--	--	--
50-74% of Full Yield	Acres	--	1,152	--	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Waldo - Fuji - 15,742 Acres

Description

History The Waldo-Fuji roadless area is a parcel of much greater area called the Waldo Lake roadless area. To reduce confusion in describing the area, the descriptions of the 44,857 acres of Waldo roadless area was divided into six parcels: Fuji, Salmon Creek, Many Prairies, Koch, Moolack, and Lake. Waldo roadless area was included in both RARE I and RARE II. The original 89,590 acres of roadless area was considered for Wilderness by the United States Congress. They released 44,857 acres for multiple-use management and designated 37,157 acres as Waldo Lake Wilderness, and designated 7,577 to be added to the Three Sisters Wilderness in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 1,365 acres have been affected in the Fuji parcel by development activities.

Location and Access The location is T.21S., R.5½E., and T.22S., Rs.5, 5½ , and 6E., in Lane County. It is approximately 18 miles southeast of the city of Oakridge, just north of Salt Creek Falls along State Highway 58. It is accessed by Forest Roads 5883373, 5883, 5883381, 5883383, and 5894. Many trails traverse the area, the most heavily used being the High Divide/Eugene to Crest Trail, and Trails 3674, 3694, 3682, and 3664.

Geography and Topography This area offers a wide spectrum of geographic and topographic features; most is within the High Cascade Plateau. Topography is moderately sloping with occasional higher and steeper ridges or mountains. Elevations range from 2,900 feet to 7,150 feet at the summit of Mt. Fuji. The area is somewhat dissected in the western portion, with lower slopes being concave and upper slopes convex. The eastern portion is poorly drained with many small glacially formed lakes.

Soil The large area contains a wide variety of soil types, from deep organic soils in meadows near drainage headwalls, to shallow rocky soils and rock outcrops on steep south facing slopes. In much of the area, especially the flatter eastern portion, the upper soil profile is composed of six inches to three feet of Mazama pumice deposits. There are about 3,839 acres that have potential for severe surface erosion; and approximately 448 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The variety of soil types, elevation range, and slope aspects supports several vegetation types. Dense forests range from Douglas-fir/western hemlock types at the lower elevations, to nearly pure mountain hemlock stands at the higher elevations. Stands of Pacific silver fir occur on wetter high elevation sites. Approximately 10% of the area supports nonforest vegetation types ranging from dry rocky meadows on south slopes to wet meadows along drainages. The summit of Fuji Mountain is residence for a subalpine community of scattered subalpine fir and associated alpine herbaceous plants.

Figure C-25-1

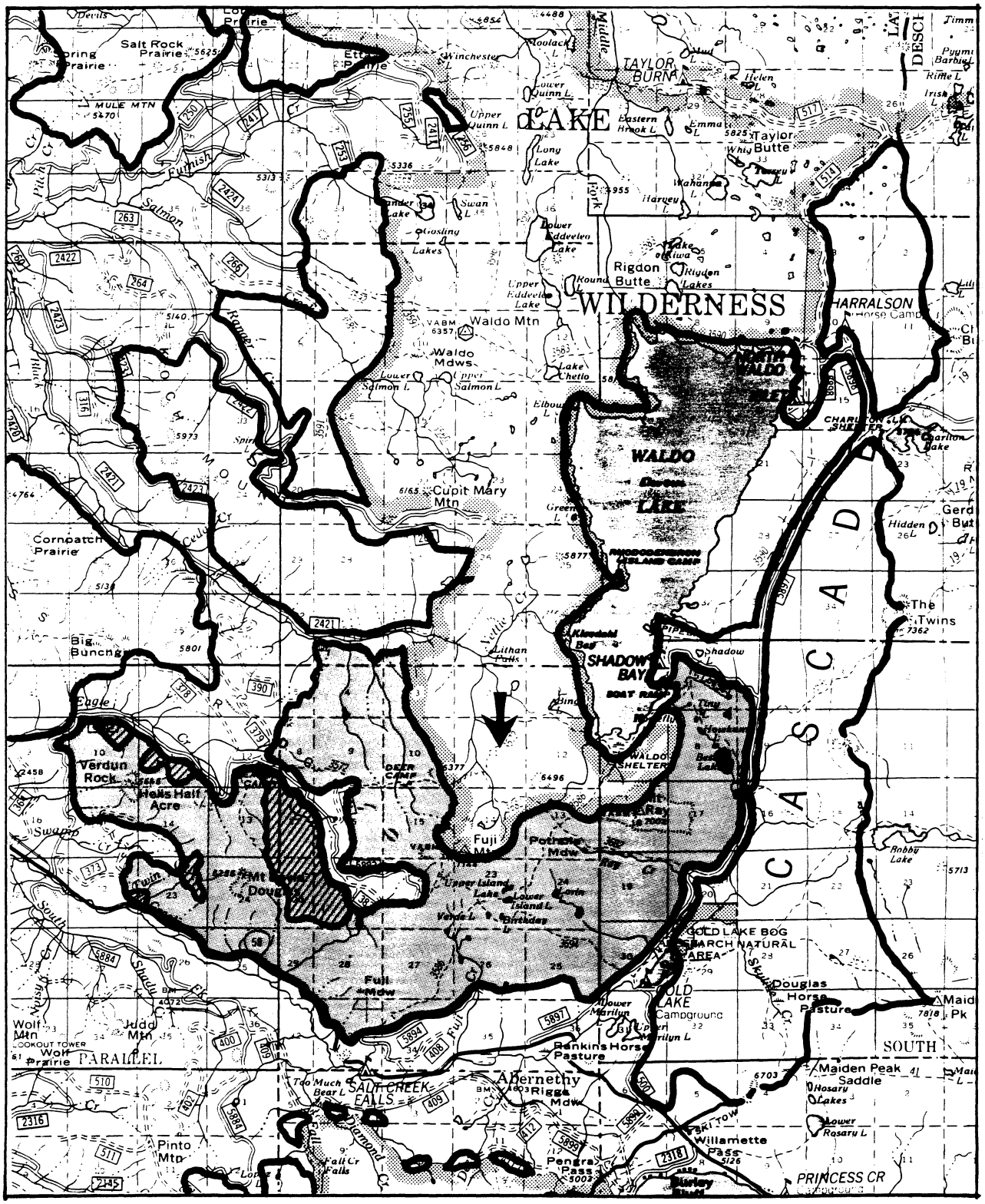
WALDO-FUJI

Roadless Areas: 15,752 Acres

Areas affected by management activities (1984-1989): 1,365 Acres

N

0 1 2 3 4 5 Miles


WILDERNESS
LAKE
WALDO
LAKE
SHADOW BAY
Waldo Mtn
Cupit Mary Mtn
Rigdon Butte
Taylor Butte
Fuji Mtn
Mt Ray
Mt Doug
Diamond Peak
Maiden Peak
The Twins
Salt Rock Prairie
Cornpatch Prairie
Big Buncha
Verdun Rock
Wolf Mtn
Judd Mtn
Pinto Mtn
Abernethy Rigg
Rankins Horse Pasture
Douglas Horse Pasture
Willamette Pass
Penges Pass
Maiden Peak Saddle
Gold Lake Campground
Gold Lake Bog Research Natural Area
Waldo Mdws
Fuji Mdw
Potrero Mdw
Waldo Shelter
Charlton Lake
Robby Lake
Lower Rosary L
Rosary Lakes
Lower Marilyn L
Upper Marilyn L
Lower Island L
Upper Island Lake
Lower Quinn L
Upper Quinn L
Lower Eddeeleo Lake
Upper Eddeeleo Lake
Lake Chetlo
Lake Ollalie
Riddon Lakes
Gosling Lakes
Lower Salmon L
Upper Salmon L
Swan L
Long Lake
Eastern Hemlock L
Emma L
Helen L
Harvey L
Roolack L
Winchester
Ett Prairie
Spring Prairie
Devils L
Timm
Pyumi Barbie
Rifle L
Irish L
Hidden L
Green L
Elbow L
Shadow L
Lithan Falls
Too Much Bear L
Fall Cr Falls
Swamp Cr
Eagle Cr
Scuttle Cr
Furnish Cr
Salmon Cr
Kramer Cr
Pitch Cr
Mule Mtn
Wolf Prairie
Lookout Tower
Helks Half Acre
Ski Tow
Princess Cr
Cascade
Mountains
South Parallel
Salt Creek Falls
Diamond Cr
Fall Cr
Roaring R
Middle Fork
Horse Camp
Campground
Boat Ramp
Shelter
Lookout Tower
Research Natural Area
Pasture
Saddle
Lakes
Pass
Peak
Creek
River
Mountains
Parallel
Falls
Mdw
Mdws
Meadows
Lake
Lakes
Butte
Mtn
Mountain
Prairie
Rock
Twins
Bog
Campground
Shelter
Boat Ramp
Horse Camp
Pasture
Saddle

Ecosystem There is one major potential vegetation zone and one vegetation community according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock *(Abies-Tsuga)* forest (004).

Current Uses Current management direction (FLMP 1977) provides for timber production on about three-quarters of the area. The eastern quarter is included in the Waldo Lake Recreation Area and provides for a variety of recreational activities. The area in general is used for hiking, hunting, fishing and camping. The Recreational Opportunity Spectrum (ROS) classes are Roaded Natural in the west and Semiprimitive Nonmotorized to the east. Plantations are present in the western portion. Since this area was inventoried in 1984 management activities are estimated to have affected 800 acres of the area.

Appearance The dense forests and openings created by lakes, meadows, frequent rock outcrops, and high peaks provide a high diversity of scenic and recreational experiences.

Surroundings The area is adjacent to the southern end of the Waldo Lake Wilderness and its eastern portion is adjacent to the Waldo-Lake and Maiden Peak roadless areas. All are managed for recreational use. Adjacent areas to the south and west provide for intensive and extensive timber management. A portion of the southern boundary is defined by State Highway 58, a major commercial truck route for crossing the Cascade Range and scenic highway.

Attractions Attractions within the Fuji Area are numerous. Fuji Mountain, the second highest peak on the Oakridge Ranger District, provides excellent views of all the surrounding Cascade Crest. The area contains 11 lakes over five acres in size, all of which contain fish and a large swamp adjacent to Black Creek. Fuji Meadows is the largest of many meadows, several of which are located in the Deer Camp Area. The cliffs below Mt. David Douglas provide an impressive view from State Highway 58 as well as some of the most challenging rock climbing in the area. Hells Half Acre and Verdun Rock provide a diverse hiking experience to rugged dry meadows with diverse plant life. Most all creeks have picturesque waterfalls.

Capability

Manageability and Boundaries Boundaries follow topographic features and roads making the area easier to be administer as a wilderness resource. Boundary changes would be necessary to eliminate nonconforming uses. However, the roads would provide access to the area.

Natural Integrity Old harvest units represent about 2% of the total area. The extensive network of trails serves to disperse recreationists throughout the area, thus eliminating overuse of any one section. Betty Lake is an exception; it gets high use.

Natural Appearance Most visitors find this roadless area apparently natural, except for the harvest units on the flat near Mt. David Douglas.

Opportunity for Solitude Opportunities for solitude are very good since a great amount of topographic diversity and fairly dense vegetation screens people and objects within several hundred feet.

This area is contiguous with the Waldo Lake Wilderness. The distance from the perimeter to core is three to 5 miles. Offsite intrusions, mostly in the form of road, highway, and railroad noise are perceptible but relatively distant. Some logging operation noise may be perceptible.

Opportunity for Solitude Abundant primitive recreation opportunities exist for back country exploration. Many small lakes and several isolated, medium sized lakes provide opportunities for cross-country hiking and fishing. Mt. Ray is a relatively easy peak, but must be navigated without the benefit of a trail.

Challenging Experiences Fuji Mountain, Verdun Rock, and Mt. David Douglas are all moderately challenging peaks.

Special Features Several old-growth hemlocks, with carvings on them, indicate the early camp locations of one of the first USDA Forest Service Rangers in this area, Cy Bingham. They are located along the South Waldo Trail. A historic sheepherders' camp still has some remains near Hells Half Acre. A historic fire lookout was once established on Fuji Mountain; nothing substantial remains of this lookout. There are prehistoric cultural resource sites near Mt. David Douglas and Deer Camp with considerable lithic scatterings.

The wet meadow-riparian complex located on Mt. David Douglas represents a unique ecological system from the standpoint of both big game use and botanical values. A number of unique, uncommon, and/or sensitive plant species are found, including *Asarum caudatum*, *Eburophyton austinae*, *Hypopitys monotropa*, and various sphagnums supporting carnivorous plants, including two species of sundew. The spotted frog, *Rana pretiosa*, considered threatened by the State of Oregon, also occurs in this area. Some bald eagle use occurs at Gold Lake.

Wolverine habitat is located near Mt. Ray. Fishers are found occasionally throughout the area. Spotted owls have been located in the Black Creek and Gold Lake areas. No federally listed endangered or threatened plant species are known to be present.

Availability

Resource Potentials

Livestock Resource No potential for domestic livestock; however, there is good potential for recreation stock use.

Timber Resource The roadless area includes about 10,750 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, lodgepole pine, and mountain hemlock occupy the area representing about 420 million board feet. If stands are converted to a managed condition, biological potential yield will be 1,055,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Wildlife Resource Some of the most valuable big game summer range on Oakridge District occurs in the vicinity of Verdun Rock and Mt. David Douglas. The Deer Camp area between Fuji Mountain and Black Creek also receives heavy use. A major seasonal migration route for elk runs through the area between Mount Ray and Pothole Meadows. Winter wolverine activity has been documented over much of the east end.

Theoretically, it might be possible to approach optimum forage-cover ratios by timber harvest, but big game animals flourish under existing conditions that it seems unlikely that disturbance could provide any significant improvements. Increased human activity resulting from roading could result in a net loss of habitat, for big game as well as old growth dependant species. Various small lakes support a sports fishery, most notably at Lucas Lake and several unnamed lakes located near Deer Camp.

Recreation Resource Capacity estimates indicate that this area could provide 9,060 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors. Two potential interpretive sites, each an acre in size, and one potential snow park site have been identified. One of the potential interpretive sites could accommodate 20 Persons-At-One-Time (PAOT) and provide 1,920 RVDs annually. The other site could accommodate 15 PAOT and provide 720 RVDs. The potential snow park site could accommodate 300 PAOT and provide 16,800 RVDs annually.

Cultural Resources The Waldo-Fuji roadless area contains a large share of ground that could be classed as high potential for artifacts and sites. There is abundant water in most locations combined with a variety of upland food resources such as huckleberries, pond lilies (wocus), seeds, and game. This was likely a major resource catchment area during the summer and fall for many prehistoric people.

Only a small portion has been surveyed in the western portion of the Waldo roadless area. Four basic types of cultural resources have been derived: 1) Upland prehistoric Native American lithic scatters along ridges and in saddles; 2) lithic scatters and "campsites" adjacent to lakes and springs; 3) historic sheepherding camps, trapping camps, and cabins; and 4) historic USDA Forest Service guard stations, shelters, and petroglyphs.

Management Considerations There have been 38 spot fires since 1943. Because of the great variety of vegetative communities, fuel loadings are just as diverse, ranging from five to 100 tons per acre.

Need

Nearby Wilderness and Its Use The Waldo-Fuji roadless area is adjacent to the the Waldo Lake Wilderness (37,157 acres) and is 2 miles north of the Diamond Peak Wilderness (53,773 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 55 miles by highway to the southeast of Eugene, Oregon.

Interest by Proponents The Waldo Lake roadless area generated a high amount of interest with 71% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Waldo-Fuji roadless area. In Alternatives NC, K, A, J, and W, 24 to 64% of this area will be affected by road construction and timber harvest. Alternative D and L will develop 3% of the area. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Portions of this area contiguous to the Waldo Lake Wilderness may remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. All Alternatives maintain the option of future Wilderness consideration on part of this area. Figure C-25-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Waldo-Fuji roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, and A. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L, D, J, and W. The amounts of other goods and services to be provided from the area for each Alternative are illustrated

in Figure C-25-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-25-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	14,888
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	1,109	1,088	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	64	--	64	--	--	--	256
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	1,152	917	597	597	427	64
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	171	171	21	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	21	5,674	21	21	--	--	--
Management Area **10c**	--	--	--	448	619	448	85
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	5,631	--	5,631	9,769	9,726	14,398	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	2,474	--	64	43	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	1,408	--	1,301	1,408	128	85
Management Area **11d**	256	320	256	320	--	--	--
Management Area **11e**	1,493	--	1,365	--	--	--	171
Management Area **11f**	683	981	640	405	213	--	149
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	7,572	3,157	6,335	1,450	1,813	299	--
15 Riparian [2]							
Management Area **15**	*	385	320	213	213	21	21

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-25-3. Waldo-Fuji Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	14,888
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	5,424	--	5,424	9,105	9,059	11,548	--
	Acres	5,631	--	5,631	9,769	9,726	14,398	--
Semiprimitive Motorized	RVDs	26	13,999	26	1,323	1,777	1,258	130
	Acres	21	5,674	21	469	619	448	85
Roaded Natural	RVDs	7,237	27,170	14,844	15,436	11,212	2,890	8,422
	Acres	2,517	4,437	3,754	3,989	3,541	597	768
Roaded Modified	RVDs	24,907	16,752	21,945	5,505	6,644	1,120	--
	Acres	7,572	5,631	6,335	1,514	1,856	299	--
Trails								
Existing Trails								
Full Protection Level	Miles	15.0	8.0	16.0	20.0	17.0	21.0	21.0
Moderate Protection Level	Miles	2.0	12.0	2.0	1.0	5.0	--	0.0
Low Protection Level	Miles	4.0	3.0	3.0	1.0	--	--	--
Potential Trails								
Full Protection Level	Miles	1.0	2.0	2.0	4.0	5.0	5.0	6.0
Moderate Protection Level	Miles	0.0	1.0	0.0	1.0	1.0	--	--
Low Protection Level	Miles	4.0	3.0	4.0	1.0	--	1.0	--
Visual Quality Objectives								
Preservation	Acres	5,695	1,322	6,783	11,497	11,412	14,824	15,208
Retention	Acres	2,176	981	2,005	853	832	448	405
Partial Retention	Acres	299	7,807	619	1,877	1,642	171	128
Modification	Acres	--	2,474	--	64	43	--	--
Maximum Modification	Acres	2,572	3,157	6,335	1,450	1,813	299	--
1st Decade								
Road Construction	Miles	--	4.0	6.0	3.0	2.8	1.0	0.2
Area Harvested	Acres	--	1,062	1,312	552	479	114	51
Programmed Timber Harvest	MBF	--	7,980	9,885	4,058	3,747	1,605	350
Area Remaining Undeveloped	%	--	79	74	89	91	98	99
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	5,332	4,288	4,373	2,219	2,303	362	85
75-94% of Full Yield	Acres	1,003	4,458	1,152	384	--	--	--
50-74% of Full Yield	Acres	427	917	405	320	384	--	171
30-49% of Full Yield	Acres	--	--	--	--	--	--	85

Waldo - Salmon Creek - 3,007 Acres

Description

History The Waldo-Salmon Creek roadless area is a parcel of much greater area called the Waldo roadless area. To reduce confusion in describing the area, the descriptions of the 44,857 acres of Waldo roadless area was divided into six parcels: Fuji, Salmon Creek, Many Prairies, Koch, Moolack, and Lake. Waldo roadless area was included in both RARE I and RARE II. The original 89,590 acres of roadless area was considered for Wilderness by the United States Congress. They released 44,857 acres for multiple-use management and designated 37,157 acres as Waldo Lake Wilderness, and designated 7,577 to be added to the Three Sisters Wilderness in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 1,003 acres have been affected in the Salmon Creek parcel by development activities.

Location and Access The area includes portions of T.21S., R.5 and 5½E., and T.21S., R.5½E., in Lane County. The area is within the Oakridge Ranger District and approximately 12 miles east of the City of Oakridge. Access is by Forest Roads 2422, 2424, 2424266, and 2417253. Access to the interior is through Trails 3585, 3591, 3592, and 3568 which traverse the area in route to the Waldo Lake Wilderness.

Geography and Topography Topography is quite varied, ranging from flat, glaciated valley bottoms and broad gentle ridgetops to steep midslopes and cirque heads. Three major streams traverse the area, Salmon Creek, Ranger Creek, and Furnish Creek. These streams were highly glaciated in the past. The area also contains numerous smaller, somewhat dissected drainages. Elevations range from 3,100 to 5,850 feet above sea level.

Soil Soil types are quite variable and tend to be moderately deep along major drainages and somewhat shallow elsewhere. There are areas of talus rock and outcrops on the main valley sides and heads of drainages. There are about 7252 acres that have potential for severe surface erosion.

Vegetation Vegetation types range from old-growth Douglas-fir, western hemlock, and red cedar stands along the lower portions of the major drainages to stands of mountain hemlock, true-fir, or lodgepole pine on the broad ridgetops. There are extensive areas, especially in the upper reaches of Salmon Creek, where prehistoric fires have created large, open, brushy areas with trees widely scattered. There is a unique mature chinquapin grove about one half mile in on Trail 3585.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-26-1

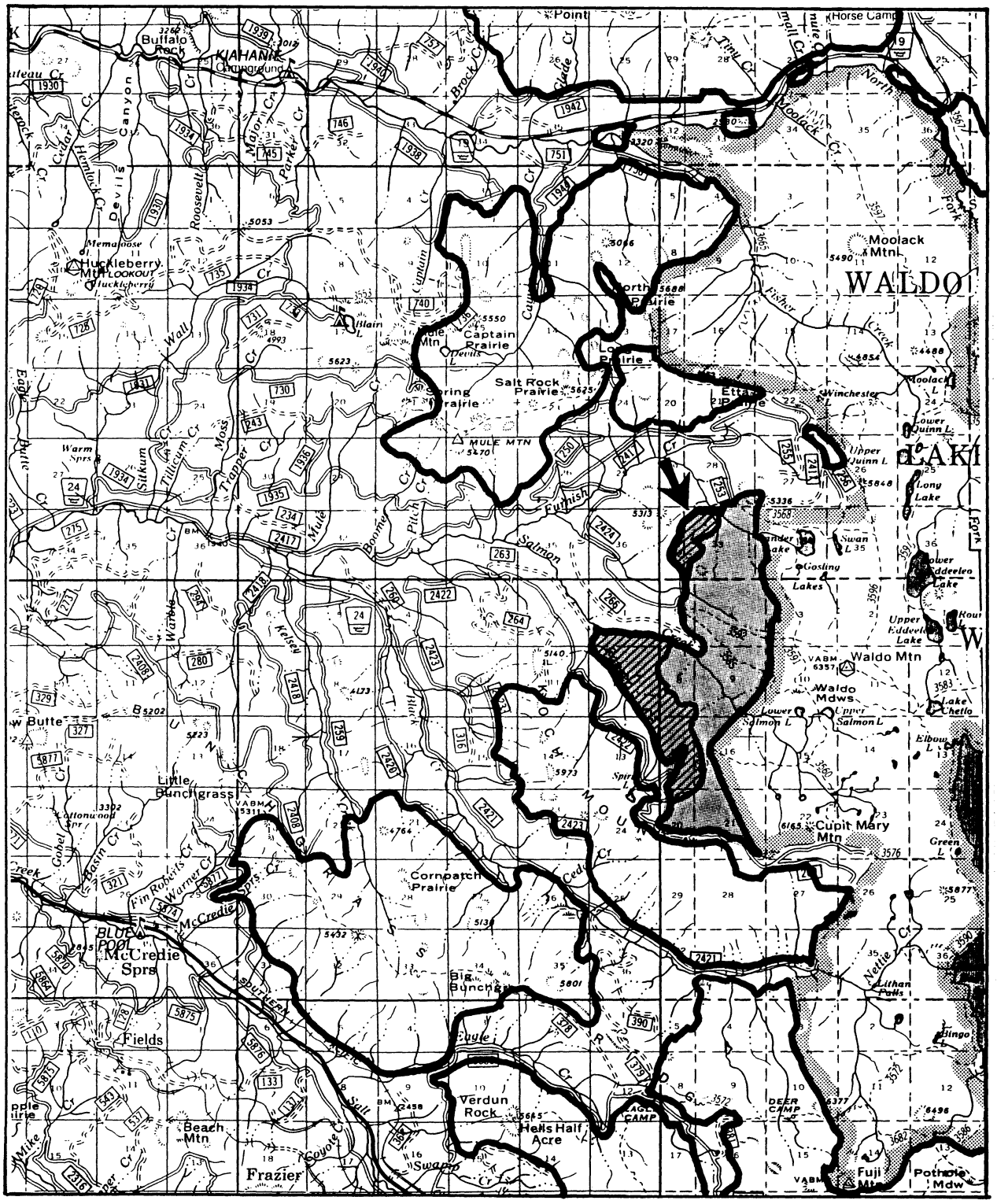
WALDO-SALMON CREEK

Roadless Areas: 3,008 Acres

Areas affected by management activities (1984-1989): 1,003 Acres

N

0 1 2 3 4 5 Miles



Current Uses Management direction as documented in the 1977 Willamette Land Management Plan provides commercial timber harvest over most of the area. As of 1985, 220 acres are under contract for harvest, involving 3.2 miles of road construction. The area is also used for hiking, fishing, and hunting to a moderate degree. Since this area was inventoried in 1984 management activities are estimated to have affected 1,120 acres of the area.

Appearance This area contains dense stands of old-growth timber, extensive brushy burned over areas, occasional rock outcrops, and talus slopes.

Surroundings The eastern boundary is adjacent to the newly created Waldo Lake Wilderness. To the south and southwest, the area is separated from the Waldo-Koch roadless area by Forest Road 2422. All areas adjacent to the Salmon Creek roadless area, except the eastern boundary that is common with the Waldo Lake Wilderness, are designated for commercial timber production.

Attractions Salmon Creek and Furnish Creek riparian habitats are the main attractions.

Capability

Manageability and Boundaries The boundaries would be modified to eliminate nonconforming uses such as plantations and roads. This would provide a boundary that would be easy to mange for its natural character.

Natural Integrity The harvest units and roads are present with natural processes disturbed to some extent.

Natural Appearance The roadless area appears unnatural to most people, because of the presence of timber harvest units. Evidence of unnaturalness is usually restricted to site and sound.

Opportunity for Solitude Diversity of topography offers screening potential in at least half the area, but may be limited or lacking in the remainder. Vegetative screening is good in half the area, screening people easily within a quarter mile of one another; there is limited or no screening available in the remainder. The distance from the perimeter to the approximate geographic center is from one to three miles.

Opportunity for Primitive Recreation There is good opportunity for primitive recreation. Four low standard trails lead into the Waldo Lake Wilderness. An opportunity to navigate untrailed backcountry exists.

Special Features Lithic scatterings have been identified adjacent to Forest Trail 3592, and near Waldo Meadows. No federally listed threatened or endangered plants or animals are known to be present.

Availability

Resource Potentials

Livestock Resource This area has no potential for domestic livestock, and good potential for recreation stock use.

Timber Resource The roadless area includes about 2,176 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 71 million board feet. If stands are converted to a managed condition, biological

potential yield will be 236,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Wildlife Resource Much of the area is used heavily as summer range by big game. Timber harvest could help improve forage-cover ratios, with a probable increase in deer and elk populations. Old-growth habitat would be reduced, unless a management system were employed to develop late-succession stands.

Recreation Resource Capacity estimates indicate that this area could provide 1,953 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. No potential trail locations have been identified. A potential interpretive site one acre in size exists which could provide 720 RVDs annually and accommodate 15 Persons-At-One-Time (PAOT).

Cultural Resources The Waldo roadless area contains a large share of ground that could be classed as high potential for artifacts and sites. There is abundant water in most locations combined with a variety of upland food resources such as huckleberries, pond lilies (wocus), seeds, and game. This was likely a major resource catchment area during the summer and fall for many prehistoric people.

Only a small portion has been surveyed in the western portion of the Waldo roadless area. Four basic types of cultural resources have been derived: 1) Upland prehistoric Native American lithic scatters along ridges and in saddles; 2) lithic scatters and "campsites" adjacent to lakes and springs; 3) historic sheepherding camps, trapping camps, and cabins; and 4) historic USDA Forest Service guard stations, shelters, and petroglyphs.

Management Considerations Five spot fires have occurred since 1943. Fuel loading ranges from five to 100 tons per acre.

Need

Nearby Wilderness and Its Use The Waldo-Salmon Creek roadless area is adjacent to the the Waldo Lake Wilderness (37,157 acres), 12 miles north of the Diamond Peak Wilderness (53,773 acres), and 10 miles southwest of the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 60 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Waldo Lake roadless area generated a high amount of interest with 71% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Waldo-Salmon Creek roadless area. In Alternatives NC, K, A, J, and W, 93 to 96% of this area will be affected by road construction and timber harvest. Alternative D will develop 27% of the area. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternatives L and D, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Waldo Lake Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternative Lmaintains the option of future Wilderness consideration for nearly the entire arrea while

Alternative D maintains this option on about 70% of the area. Figure C-26-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Waldo-Salmon Creek roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-26-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-26-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	2,944
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	128	--	128	--	128	--	43
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	128	128	128	128	107	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	85	--	85	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	2,090	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	21
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	--	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	2,880	2,752	2,709	2,752	2,709	811	--
15 Riparian [2]							
Management Area **15**	*	43	43	43	43	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-26-3. Waldo-Salmon Creek Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	2,944
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	1,304	--
	Acres	--	--	--	--	--	2,090	--
Roaded Natural	RVDs	1,334	2,396	2,816	2,396	2,816	741	173
	Acres	128	256	299	256	299	107	64
Roaded Modified	RVDs	8,201	7,802	7,631	7,802	7,631	3,303	--
	Acres	2,880	2,752	2,709	2,752	2,709	811	--
Trails								
Existing Trails								
Full Protection Level	Miles	1.0	2.0	2.0	2.0	--	3.0	4.0
Moderate Protection Level	Miles	--	--	--	--	4.0	--	--
Low Protection Level	Miles	3.0	3.0	3.0	3.0	--	1.0	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	128	213	256	213	256	2,197	2,986
Retention	Acres	--	--	--	--	--	--	--
Partial Retention	Acres	--	43	43	43	43	--	21
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	2,880	2,752	2,709	2,752	2,709	811	--
1st Decade								
Road Construction	Miles	--	3.0	2.0	0.0	2.0	1.2	--
Area Harvested	Acres	--	453	423	23	336	274	--
Programmed Timber Harvest	MBF	--	3,341	3,174	219	2,631	2,185	170
Area Remaining Undeveloped	%	--	53	57	98	65	72	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	2,090	1,941	1,920	1,941	1,685	789	--
75-94% of Full Yield	Acres	--	21	21	21	--	--	--
50-74% of Full Yield	Acres	--	21	21	21	235	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Waldo - Many Prairies - 1,685 Acres

Description

History The Waldo-Many Prairies roadless area is a parcel of much greater area called the Waldo roadless area. To reduce confusion in describing the area, the descriptions of the 44,857 acres of Waldo Lake roadless area was divided into six parcels: Fuji, Salmon Creek, Many Prairies, Koch, Moolack, and Lake. Waldo Lake roadless area was included in both RARE I and RARE II. The original 89,590 acres of roadless area was considered for Wilderness by the United States Congress. They released 44,857 acres for multiple-use management and designated 37,157 acres as Waldo Lake Wilderness, and designated 7,577 to be added to the Three Sisters Wilderness in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 5,930 acres have been affected in the Many Prairies parcel by development activities.

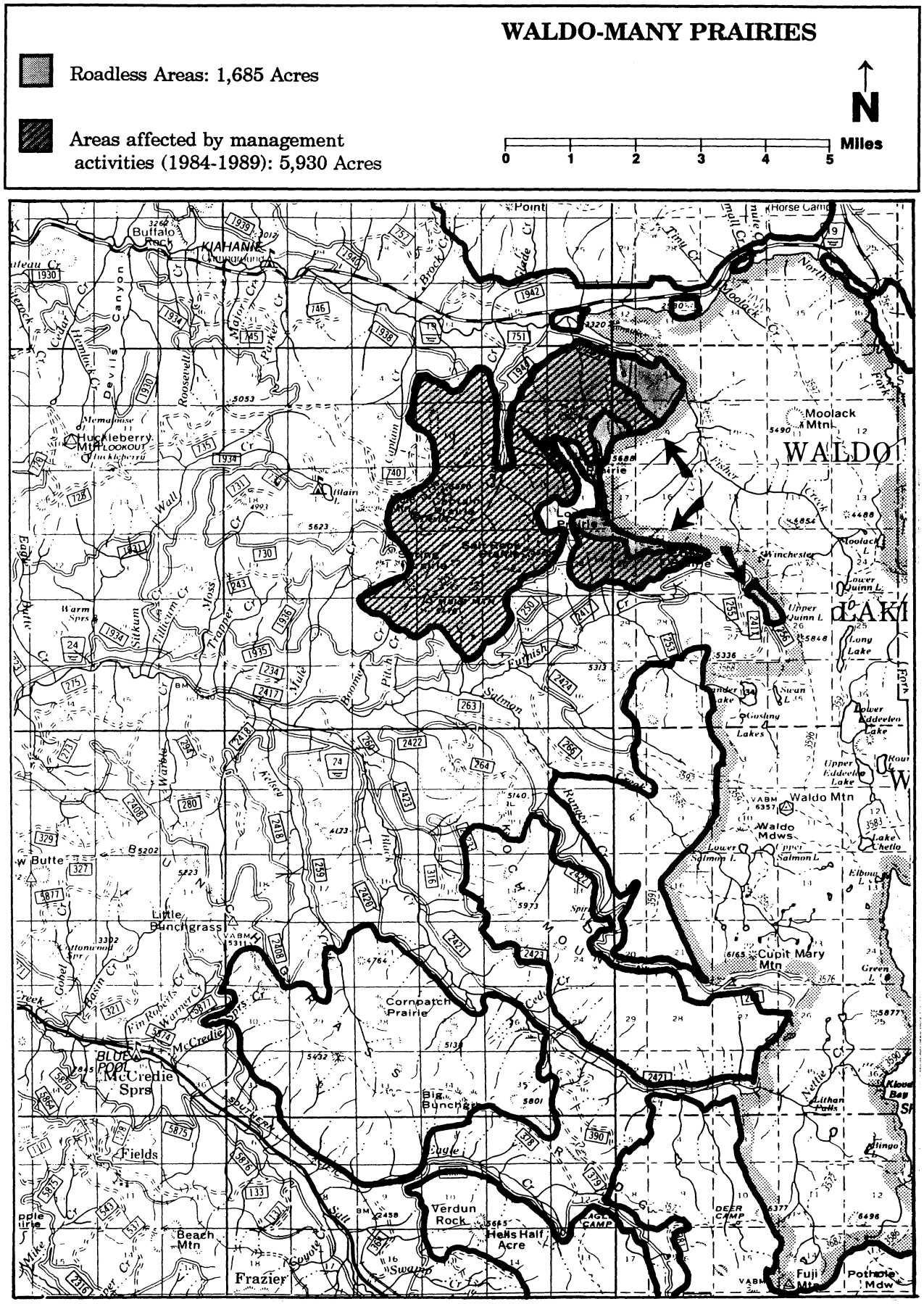
Location and Access The area includes portions of T.20S., Rs.5 and 5½E., in Lane County and is approximately 16 miles northeast of the town of Oakridge in the Oakridge Ranger District. It is accessed by Forest Roads 1944, 1938, 1944750, 2417250, 1936, 1935252, and 1934236. The Blair Lake Trail (3553) traverses the southern portion. This area borders the Waldo Lake Wilderness on the east.

Geography and Topography Elevations vary from 2,720 to 5,690 feet above sea level. Terrain is generally quite steep and dissected by numerous drainages. Some flatter areas exist on ridgetops and at the head of the major drainages. Topography has been influenced by past glaciation and a small lake occupies the cirque at the head of Cayuse Creek.

Soil A wide variety of soil types exist due to the complex land forms that occur. Soils range from moderately deep glacially influenced soils along drainages, to shallow to non-existent on the steep midslopes. Many rock outcrops occur, especially where mid slopes have been steepened by glacial activity. There are about 1,045 acres that have potential for severe surface erosion, and approximately 43 acres of potentially unstable landtypes. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The wide range of soil types, elevation and aspects generate an equally wide range of vegetation types. Old-growth forests of large Douglas-fir, western hemlock, and red cedar occur at lower elevations along drainages and on north slopes. More or less pure Douglas-fir old-growth forest exist on midslopes. The ridge tops support forests of noble fir, Pacific silver fir, and a limited amount of mountain hemlock. Occasional beargrass meadows occur along the ridgetops and grasses and forbs in wet meadows.

Figure C-27-1


WALDO-MANY PRAIRIES
Roadless Areas: 1,685 Acres
Areas affected by management activities (1984-1989): 5,930 Acres
N
0 1 2 3 4 5 Miles
Moolack Mtn.
WALDO
Waldo Mtn
Waldo Mdws
Cupit Mary Mtn
Cornpatch Prairie
Big Bunchgrass
Little Bunchgrass
McCredie Sprs
Fields
Beach Mtn
Frazier
Verdun Rock
Hens Half Acre
Fuji Mtn
Potrzie Mdw
Huckleberry Mtn. LOOKOUT
Buffalo Rock
KIAHANIE
Winchester
Upper Quinn L.
Long Lake
Swan L.
Gossling Lakes
Upper Eddeleo Lake
Lower Eddeleo Lake
Lake Chetlo
Upper Salmon L.
Lower Salmon L.
Elbow L.
Green L.
Moolack L.
Lower Quinn L.
Kingo
Lithan Falls
Klovo Bay
DEER CAMP
ACL CAMP
Horse Camp
Point
Tiny Cr.
Moolack Cr.
North Fork
Fisher Creek
Eagle Cr.
Wall Cr.
Devils Canyon
Cedar Cr.
Hemlock Cr.
Roosevelt Cr.
Major Cr.
Parker Cr.
Brock Cr.
Glade Cr.
Captain Cr.
Tipsu Cr.
Trapper Cr.
Moss Cr.
Tillicum Cr.
Sitkum Cr.
Mule Cr.
Boomer Pitch Cr.
Salmon
Fuji Mtn.
Warm Sprs
Memaloose
Villain L.
Rainy Cr.
Kinney Cr.
Warner Cr.
Fin Rocks
Gobel Creek
Kasin Cr.
Mike Cr.
Swamp Cr.
Coyote Cr.
Skill Cr.
Eagle Cr.
Nellie Cr.
Cedar Cr.
Butte
Little Butte
Pipe Creek
Apple Creek
SOUTHERN PACIFIC R.R.
Point
Horse Camp

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses Management direction in the 1977 Forest Land Management Plan prescribes intensive and extensive timber management. To date, 761 acres have been harvested under 10 different timber sales. This activity has involved the construction of about 9 miles of road. Recreational use is moderate to light, mostly involving hiking on the Blair Lake Trail, elk hunting, and occasional fishing at Devils Lake and Fisher Creek. Since this area was inventoried in 1984 management activities are estimated to have affected
1,120 acres of the area.

Appearance The extensive beargrass meadow system along the ridgetops, which is surrounded by dense forests covering steep and sometimes deeply dissected topography, makes this area appear to be scenic, wild, and very unique.

Surroundings The roadless area is adjacent to the northwestern boundary of the Waldo Lake Wilderness. The north, south, and west areas are intensively managed forest lands.

Attractions The many beargrass meadows provide opportunities for viewing wildlife and landscape, including many waterfalls along the steep drainages.

Capability

Manageability and Boundaries Intensively planned roads and harvest units that will deeply penetrate the area preclude the primitive character, even though it is adjacent to the Waldo Lake Wilderness.

Natural Integrity Ecological processes are still functioning in an unaffected manner except for the exclusion of fire for the last 50 to 60 years. This has resulted in a small change in the abundance of brushy vegetation and, to an even smaller extent, has provided for some forest encroachment into the beargrass meadows. In addition there is the effect of 761 acres of timber harvest, and 9 miles of road construction.

Natural Appearance Aside from the areas where road construction and timber harvesting have occurred, the area appears very natural to the average observer. The area along the trail still leaves an impression of naturalness, as the topographic screening does not bring the harvest units into view.

Opportunity for Solitude Topographic variation and dense vegetation provide a moderate opportunity for solitude.

Challenging Experiences Cross-country hiking in to Devils Lake would be a moderate challenge due to the lack of trails.

Special Features Mule Mountain is the site of Old Lookout Tower, there are no structural remains but part of the foundation is still evident. There are small archaeological sites in the prairies and lithic scatters along the Blair Lake Trail. Several sensitive plant species have been identified in the high prairies. No federally listed threatened and endangered species are known to be present.

Availability

Resource Potentials

Livestock Resource There is good potential for domestic livestock, and recreation stock use in the prairie areas.

Timber Resource The roadless area includes about 1,088 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 50 million board feet. If stands are converted to a managed condition, biological potential yield will be 43,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Wildlife Resource The Waldo-Many Prairies roadless area receives moderate summer elk use which occurs along the ridgetop from Captain Prairie east to North Prairie. Timber harvest could provide increased forage where side-slopes are not too steep.

Recreation Resource Capacity estimates indicate that this area could provide 1,103 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified.

Cultural Resources The Waldo-Many Prairies roadless area contains a large share of ground that could be classed as high potential for artifacts and sites. There is abundant water in most locations combined with a variety of upland food resources such as huckleberries, pond lilies (wocus), seeds, and game. This was likely a major resource catchment area during the summer and fall for many prehistoric people. Only a small portion has been surveyed in the western portion of the Waldo roadless area. Four basic types of cultural resources have been derived: 1) Upland prehistoric Native American lithic scatters along ridges and in saddles; 2) lithic scatters and "campsites" adjacent to lakes and springs; 3) historic sheepherding camps, trapping camps, and cabins; and 4) historic USDA Forest Service guard stations, shelters, and petroglyphs.

Management Considerations

Fire There have been 32 spot fires since 1943. Fuel loads vary from five to 150 tons per acre.

Insect and Disease Extensive bark beetle damage is evident between Devils Lake, Mule Mountain, and Captain Prairie.

Need

Nearby Wilderness and Its Use The Waldo-Many Prairies roadless area is adjacent to the the Waldo Lake Wilderness (37,157 acres) and 10 miles southwest of the Three Sisters Wilderness (283,593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 60 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Waldo Lake roadless area generated a high amount of interest with 71% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Waldo-Many Prairies roadless area. In all Alternatives, except Alternative L, 86 to 100% of this area will be affected by road construction and timber harvest. Alternative L will develop 6% of the area. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives except Alternative L, would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Waldo Lake Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Figure C-27-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Waldo-Many Prairies roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, D, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternative L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-27-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-27-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	1,578
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	85	--	85	--	85	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	128	149	128	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	512	427	619	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	85
Management Area **11d**	85	--	85	235	--	341	--
Management Area **11e**	--	--	--	--	--	--	21
Management Area **11f**	--	--	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	1,514	1,642	1,472	789	981	555	--
15 Riparian [2]							
Management Area **15**	*	43	43	21	43	43	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-27-3. Waldo-Many Prairies Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	1,578
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	617	247	864	1,630	1,038	2,791	914
	Acres	171	43	213	384	277	512	107
Roaded Modified	RVDs	2,848	3,037	2,753	2,430	2,677	5,172	--
	Acres	1,514	1,642	1,472	1,301	1,408	1,173	--
Trails								
Existing Trails								
Full Protection Level	Miles	2.0	2.0	2.0	2.0	2.0	2.0	3.0
Moderate Protection Level	Miles	--	--	--	--	1.0	0.0	--
Low Protection Level	Miles	0.0	0.0	0.0	0.0	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	85	--	85	--	85	--	1,578
Retention	Acres	--	--	--	128	149	128	21
Partial Retention	Acres	85	43	128	256	43	384	85
Modification	Acres	--	--	--	513	427	619	--
Maximum Modification	Acres	1,514	1,642	1,472	789	981	555	--
1st Decade								
Road Construction	Miles	--	1.5	2.0	1.0	0.8	2.8	0.1
Area Harvested	Acres	--	173	239	148	150	459	--
Programmed Timber Harvest	MBF	--	1,288	1,932	1,346	1,241	4,652	--
Area Remaining Undeveloped	%	--	68	56	73	73	16	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	1,003	1,066	981	981	917	896	43
75-94% of Full Yield	Acres	--	21	21	21	--	85	--
50-74% of Full Yield	Acres	--	--	--	--	--	21	21
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Waldo - Koch - 4,970 Acres

Description

History The Waldo-Koch roadless area is a parcel of much greater area called the Waldo roadless area. To reduce confusion in describing the area, the descriptions of the 44,857 acres of Waldo Lake roadless area was divided into six parcels: Fuji, Salmon Creek, Many Prairies, Koch, Moolack, and Lake. Waldo Lake roadless area was included in both RARE I and RARE II. The original 89,590 acres of roadless area was considered for Wilderness by the United States Congress. They released 44,857 acres for multiple-use management and designated 37,157 acres as Waldo Lake Wilderness, and designated 7,577 to be added to the Three Sisters Wilderness in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 4,586 acres have been affected in the Koch roadless area by development activities.

Location and Access This area is within T.21S., Rs.5 and 5½E., in Lane County. It is approximately 15 miles east of the city of Oakridge and is accessed by Forest Service Roads 2421, 2423, and 2422. Trail access to the interior is limited to Forest Trail
3584 into Spirit Lake.

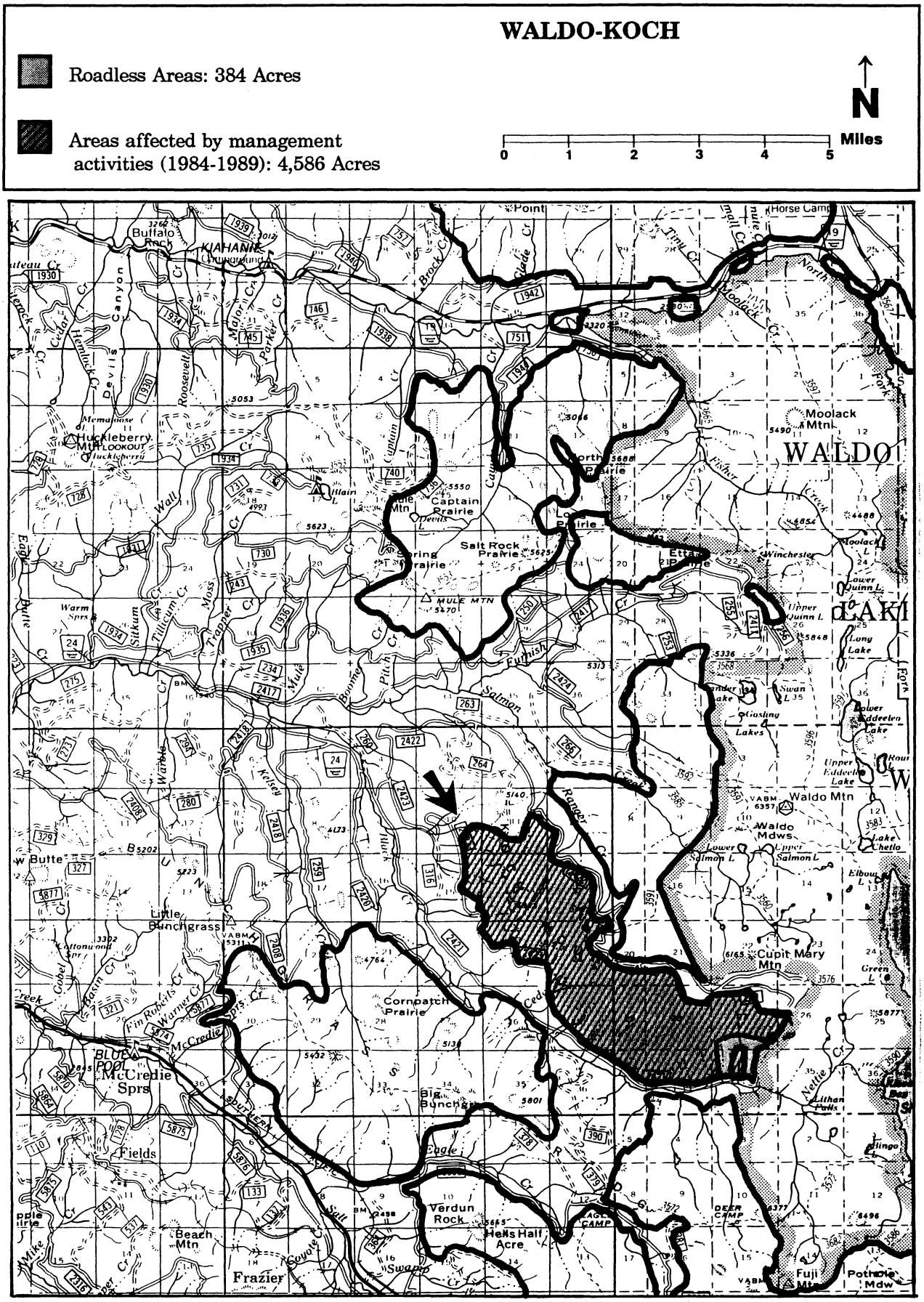
Geography and Topography This area is composed of a large ridge (Koch Mountain) and an associated portion of the High Cascades plateau. Koch Mountain and the smooth to concave slopes into Ranger Creek and Black Creek are moderately dissected by permanent and intermittent drainages. The area has been shaped by glacial processes. Elevations range from 3,200 to 5,910 feet. Slopes range from flat to very steep, in excess of 100%. Several glacially formed lakes can be found in the area.

Soil Soil types are many and various, ranging from deep cobbly soils along major drainages to moderately steep to shallow pumice soils on the high plateau and ridgetops. Soils on the midslopes are rocky and shallow and many large and extensive rock outcrops occur. There are about 320 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetation consists of old-growth Douglas-fir forests below 4,500 feet elevation, with western red cedar and western hemlock along drainages and on lower slopes. Above the Douglas-fir forests are stands of noble fir and Pacific silver fir and on the flat plateau are extensive stands of true fir/mountain hemlock forest types. There are occasional rocky meadows along ridgetops and a small wet meadow/brush community adjacent to Spirit Lake, but for the most part, the area is densely forested.

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-28-1


WALDO-KOCH
Roadless Areas: 384 Acres
Areas affected by management activities (1984-1989): 4,586 Acres
N
0 1 2 3 4 5 Miles
WALDO
LAKE
Moolack Mtn
Waldo Mtn
Cupit Mary Mtn
Huckleberry Mtn
Captain Prairie
Salt Rock Prairie
Cornpatch Prairie
Little Bunchgrass
Big Bunchgrass
McCredie Sprs
Fields
Beach Mtn
Frazier
Verdun Rock
Hells Half Acre
Fuji Mtn
Potholes Mdw
Waldo Mdws
Lower Salmon L
Upper Salmon L
Lake Chetlo
Lower Odderson Lake
Upper Odderson Lake
Swan L
Gosling Lakes
Long Lake
Lower Quinn L
Upper Quinn L
Moolack L
Winchester L
Green L
Elbow L
Lithan Falls
Mule Mtn
MULE MTN
Buffalo Rock
KIAHANIE
Horse Camp
Point
Devils Canyon
Hemlock Cr
Cedar Cr
Major Cr
Parker Cr
Roosevelt
Brock Cr
Timt Cr
Moolack Cr
North Fork
Fisher Creek
Captain Cr
Wall Cr
Eagle Cr
Warm Sprs
Sitkum
Trillicum Cr
Trapper Cr
Moss
Mule Cr
Boomer Cr
Pitch Cr
Futrush
Salmon
Ranger
Kelsey
Warner
Butte
Fin Robuts Cr
Warner Cr
Sprs Cr
Basin Cr
Gobel
Cottonwood Spr
Eagle
Salt
Coyote
Swamp Cr
Mike
Nettie
Elingo
Pothole Mdw
DEER CAMP
EAGLE CAMP
VABM
BM

Current Uses Current management direction is for commercial timber harvesting. Approximately 660 acres of timber has been sold for harvest involving the construction of 8.6 miles of road. Other uses are minimal, consisting mostly of elk hunting. Spirit Lake is also a popular camping and fishing spot. Since this area was inventoried in 1984 management activities are estimated to have affected 640 acres of the area.

Appearance The heavy forest cover, where harvest units are not present, and the steep rocky areas provide some scenic views and a rugged natural appearance.

Surroundings The east end is contiguous with the Waldo Lake Wilderness. The north, east, south, and southeast boundaries are adjacent to other roadless areas, though separated from them by roads and some past timber harvesting activities. The north and west boundaries are adjacent to intensively managed commercial forest land. A fair amount of recreational activity occurs in the general area surrounding the Waldo-Koch roadless area, mostly in the form of hunting, fishing, and camping.

Attractions The main attraction is Spirit Lake and the quality elk hunting that can be found along the ridgetops and on the steep south facing slopes of Koch Mountain.

Capability

Manageability and Boundaries If nonconforming uses were eliminated by boundary change, the area would no longer be contiguous with the Waldo Lake Wilderness and the small size would make it difficult to manage for its primeval character.

Natural Integrity and Apparent Naturalness Extensive harvest units and a road system are planned as of 1985; the roads will cut deeply into the interior and will be easily visible.

Natural Appearance The roadless area would appear unnatural to most visitors.

Opportunity for Solitude Due to limited trail access, steep terrain and lack of unique features the opportunity for solitude is very good; however, the sight and sound of management activities could lessen the primitive experience considerably.

Special Features There are lithic scatterings on the Koch Mountain Plateau. No federally listed threatened or endangered plants or animals are known to be present.

Availability

Resource Potentials

Livestock Resource There is no potential for domestic livestock, and very limited potential for recreation stock use.

Timber Resource The roadless area includes about 299 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 12 million board feet. If stands are converted to a managed condition, biological potential yield will be 34,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Wildlife Resource Summer use by big game animals is heavy near Spirit Lake and the flats south and west of Cupit-Mary Mountain. A significant sports fishery exists at Spirit Lake. Timber harvest

and/or roading of the steep slopes between Koch Mountain and Black Creek could impact important migration routes for big game.

Recreation Resource Capacity estimates indicate that this area could provide 251 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. No potential trail locations have been identified.

Cultural Resources The Waldo Lake roadless area contains a large share of ground that could be classed as high potential for artifacts and sites. There is abundant water in most locations combined with a variety of upland food resources such as huckleberries, pond lilies (wocus), seeds, and game. This was likely a major resource catchment area during the summer and fall for many prehistoric people.

Only a small portion has been surveyed in the western portion of the Waldo roadless area. Four basic types of cultural resources have been derived: 1) Upland prehistoric Native American lithic scatters along ridges and in saddles; 2) lithic scatters and "campsites" adjacent to lakes and springs; 3) historic sheepherding camps, trapping camps, and cabins; and 4) historic USDA Forest Service guard stations, shelters, and petroglyphs.

Management Considerations

Fire There have been 13 spot fires since 1943. Fuel loading varies from five to 150 tons per acre.

Insect and Disease Two small areas of bark beetle damage, one around Spirit Lake and one near Spirit Creek, occur within this roadless area.

Need

Nearby Wilderness and Its Use The Waldo-Koch roadless area is adjacent to the Waldo Lake Wilderness (37,157 acres), ten miles north of the Diamond Peak Wilderness (53,773 acres), and ten miles southwest of the Three Sisters Wilderness (283,539 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 60 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Waldo Lake roadless area generated a high amount of interest with 71% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Waldo-Koch roadless area. In all Alternatives, 100% of this area will be affected by road construction and timber harvest. Alternative L will develop 84% of the area. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives would alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Waldo Lake Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Figure C-28-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Waldo-Koch roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-28-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-28-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	85
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	85	--
Management Area **11e**	--	--	--	--	--	--	21
Management Area **11f**	--	--	--	--	--	--	277
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	384	384	384	384	384	299	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-28-3. Waldo-Koch Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	85
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	--	--	--	--	--	494	988
	Acres	--	--	--	--	--	85	299
Roaded Modified	RVDs	664	664	664	664	664	475	--
	Acres	384	384	384	384	384	299	--
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	--	--	--	85
Retention	Acres	--	--	--	--	--	--	299
Partial Retention	Acres	--	--	--	--	--	85	--
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	384	384	384	384	384	299	--
1st Decade								
Road Construction	Miles	--	0.5	0.5	0.0	0.3	0.4	0.2
Area Harvested	Acres	--	68	64	4-	52	104	35
Programmed Timber Harvest	MBF	--	503	483	33	409	827	243
Area Remaining Undeveloped	%	--	45	48	97	86	17	72
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	299	299	299	299	299	213	--
75-94% of Full Yield	Acres	--	--	--	--	--	85	--
50-74% of Full Yield	Acres	--	--	--	--	--	--	21
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Waldo - Moolack - 1,365 Acres

Description

History The Waldo-Moolack roadless area is a parcel of much greater area called the Waldo roadless area. To reduce confusion in describing the area, the descriptions of the 44,857 acres of Waldo Lake roadless area was divided into six parcels: Fuji, Salmon Creek, Many Prairies, Koch, Moolack, and Lake. Waldo Lake roadless area was included in both RARE I and RARE II. The original 89,590 acres of roadless area was considered for Wilderness by the United States Congress. They released 44,857 acres for multiple-use management and designated 37,157 acres as Waldo Lake Wilderness, and designated 7,577 to be added to the Three Sisters Wilderness in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 85 acres have been affected in the Moolack parcel by development activities.

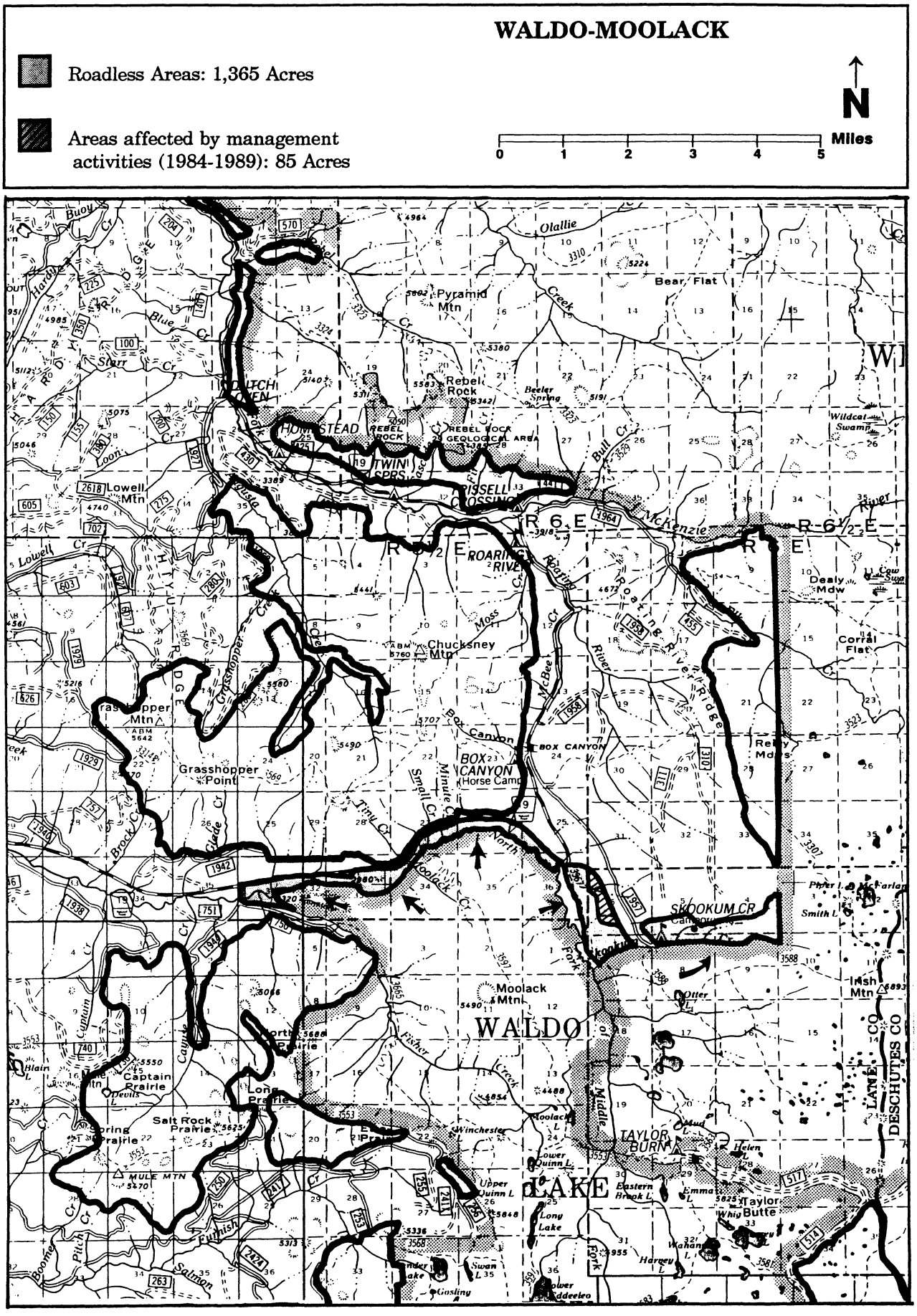
Location and Access The area includes portions of: T.19S., Rs.5, 5½, and 6E., and T.20S., R.6E., in Lane County on the Oakridge Ranger District. The Waldo-Moolack roadless area consists of two parcels. The first is a narrow strip between Forest Service Roads 19 (Aufterheide Drive) and 1944750 and Fisher Creek and the North Fork of the Middle Fork of the Willamette River which is adjacent to the newly created Waldo Wilderness Area. The second parcel is adjacent to the new addition to the Three Sisters Wilderness, east of Skookum Creek Campground, at the end of Forest Road 1957. These areas are approximately 20 miles northeast of the town of Oakridge.

Geography and Topography Elevations range from 2,150 to 5,600 feet. About half the area includes a fairly flat floodplain and glacial valley bottom along the North Fork. Another quarter includes fairly steep slopes above the North Fork and the remainder is on the High Cascades plateau that is, again, fairly flat.

Soil and Vegetation Type The flat areas along the North Fork provide deep, rocky soils of alluvial origin supporting medium aged Douglas-fir, western hemlock, and western red cedar. This same vegetation type, except red cedar extends up to about 4,500 feet in elevation. Soils on the High Cascade Plateau portion are shallow to deep, consisting of Mt. Mazama pumice, overlying glacial deposits. Vegetation is composed of mountain hemlock and true fir, with lodgepole pine occupying areas that were disturbed by fire in the recent past. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Figure C-29-1


WALDO-MOOLACK
Roadless Areas: 1,365 Acres
Areas affected by management activities (1984-1989): 85 Acres
N
Miles
0 1 2 3 4 5
WALDO LAKE
Moolack Mtn
Chucksney Mtn
Grasshopper Point
Box Canyon
Horse Camp
Pyramid Mtn
Rebel Rock
Twin Spgs
Russell Crossing
Roaring River
Lowell Mtn
Captain Prairie
Salt Rock Prairie
Spring Prairie
Long Prairie
Mule Mtn
Taylor Butte
Taylor Burn
Skookum Cr
Bear Flat
Olallie
Dealy Mdw
Corral Flat
Wildcat Swamp
Lane Co
Deschutes Co
R 6 E
R 6½ E
R 7 E

Current Uses Management direction is for extensive and intensive management for timber production. Fishing in the North Fork and Fisher Creek and auto sightseeing from Forest Road 19 are the main uses. In addition, some hiking occurs on Forest Trail 3567, which leads into the Waldo Lake and Three Sisters Wildernesses from Forest Road 19.

Appearance The dense stands of large trees along the North Fork of the Middle Fork of the Willamette River, which is designated as a scenic wild trout stream by the State of Oregon, make this area appear very scenic; however, the extensive timber salvage along the North Fork of the Middle Fork of the Willamette River has altered a small amount of the natural appearance.

Surroundings The area lies immediately north of the Waldo Lake Wilderness and south of the Chucksney Mountain Undeveloped Roadless Recreation Area. Several clearcuts exist along Forest Road 19 immediately north of the roadless area.

Attractions The main attraction is the North Fork of the Middle Fork of the Willamette River, managed as a wild trout stream by the Oregon Department of Fish and Wildlife, and designated as a scenic waterway by the Oregon Department of Parks and Recreation. Sightseers are attracted to Aufterheide Drive.

Capability

Manageability and Boundaries The long, narrow section (along the North Fork) would be difficult to manage for its natural character because of the impacts already made. The area around Skookum Lake may be difficult to manage because of the heavy influx of people to the trailhead at Skookum Campground. Both of these areas are contiguous with the Three Sisters and Waldo Lake Wildernesses.

Natural Integrity As of 1985, ninety-nine acres have been harvested or are under contract to be harvested. In addition, a small amount of timber salvage in the past has occurred which included the construction of network of primitive roads and/or skid trails. There are also about two miles of developed trail with associated minimal trailhead facilities adjacent to Forest Road 19.

Aside from the above mentioned developments, most of the long term ecological processes are functioning, except that fire has been excluded for the last 70 years. Little change has occurred due to this fire exclusion, since timber stands are relatively young and much of the area is a riparian habitat type with a low rate of fire frequency.

Natural Appearance The area near Forest Road 19 does not appear natural to most vistors because of the road. However, east of Skookum Creek Campground the area is away from any developments that would reduce naturalness.

Opportunity for Solitude The narrow strip along Forest Road 19 has little opportunity for solitude due to the impact and easy access of the road. The difficulty of the adjacent terrain, however, increases the solitude potential in the two larger portions.

Opportunity for Primitive Recreation The Shale Ridge Trail is very primitive and challenging as the dense growth often hides or obliterates the trail. The upper area near Skookum Lake offers an opportunity for challenging winter travel and exploration by cross-country skiing or snowshoeing.

Special Features Portions of the Old Box Canyon Road can be found in the lower portion, plus there is an archaeological site northwest of Skookum Lake. There have been spotted owl responses

along the North Fork. The North Fork of the Middle Fork Willamette River which has been designated as a state scenic waterway.

Sensitive plant species *Eburophyton austinae*, *Hemitomes congestum* and *Pleuricospora fimbriolata* have been located here. No federally listed endangered or threatened plants or animals are known to be present.

Availability

Resource Potentials

Timber Resource The roadless area includes about 1,045 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 34 million board feet. If stands are converted to a managed condition, biological potential yield will be 125,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class III to Class V. The remaining area is unsuitable.

Wildlife Resource The Waldo-Moolack roadless area contains 21 acres of a Spotted Owl Habitat Area and 150 acres of floodplain-riparian zone of the North Fork of the Middle Fork Willamette River. This involves a state scenic waterway and a "blue ribbon" native trout fishery. There is big game winter range in and near the riparian zone, and summer range in the eastern segments. Future timber harvest in the winter range could significantly reduce optimum thermal cover. Management for development of late- successional stands could improve habitat for of both big game and old-growth dependant species.

Cultural Resources The Waldo-Moolack roadless area contains ground that could be classed as high potential for artifacts and sites. There is abundant water in most locations combined with a variety of upland food resources such as huckleberries, seeds, and game. This was likely a major resource catchment area during the summer and fall for many prehistoric people.

Only a small portion has been surveyed. Four basic types of cultural resources have been derived: 1) Upland prehistoric Native American lithic scatters along ridges and in saddles; 2) lithic scatters and "campsites" adjacent to lakes and springs; 3) historic sheepherding camps, trapping camps, and cabins; and 4) historic USDA Forest Service guard stations, shelters, and petroglyphs.

Recreation Resource Capacity estimates indicate that this area could provide 902 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential developed recreation sites have been identified, and there is good potential for recreation stock use.

Management Considerations

Fire There have been three spot fires since 1943. Fuel loadings range from five to 150 tons per acre.

Insect and Disease A large area around Skookum Lake has bark beetle damage.

Need

Nearby Wilderness and Its Use The Waldo-Moolack roadless area is adjacent to the Waldo Lake Wilderness (37,157 acres) and the Three Sisters Wilderness (283.593 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 60 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Waldo Lake roadless area generated a high amount of interest with 71% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Waldo-Moolack roadless area. In Alternatives NC, K, A, J, and W, 56 to 70% of this area will become developed through road construction and timber harvest. Alternative D will develop 23% of the area and Alternative L develops 14%. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives may alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Waldo Lake and the Three Sisters Wildernesses may remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Figure C-29-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Waldo-Moolack roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives D and L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-29-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-29-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	896
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	235	235	235	171	85	235	235
Management Area **6c**	43	43	43	21	43	43	43
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	43	43	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	64	43	85	85	64	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	235	--	235	--	--	661	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	832	811	277	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	21
Management Area **11d**	149	--	107	85	85	--	--
Management Area **11e**	--	--	--	--	--	--	64
Management Area **11f**	43	--	43	--	--	--	64
12 Developed Recreation							
Management Area **12a**	21	21	21	21	43	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	21	21	21	21	21	21	21
14 General Forest							
Management Area **14a**	619	896	576	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	85	43	85	149	43	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-29-3. Waldo-Moolack Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	896
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	137	--	137	--	--	716	--
	Acres	235	--	235	--	--	661	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	4,199	4,718	4,619	5,459	5,706	4,298	5,187
	Acres	491	448	533	512	533	405	448
Roaded Modified	RVDs	2,677	2,981	2,506	2,696	2,601	380	95
	Acres	640	917	597	853	832	299	21
Trails								
Existing Trails								
Full Protection Level	Miles	2.0	1.0	2.0	1.0	2.0	1.0	2.0
Moderate Protection Level	Miles	1.0	1.0	1.0	1.0	--	1.0	1.0
Low Protection Level	Miles	--	1.0	--	1.0	--	1.0	--
Potential Trails								
Full Protection Level	Miles	--	--	--	0.0	2.0	1.0	0.0
Moderate Protection Level	Miles	2.0	2.0	2.0	2.0	--	2.0	2.0
Low Protection Level	Miles	1.0	1.0	1.0	1.0	1.0	--	0.0
Visual Quality Objectives								
Preservation	Acres	235	64	277	128	128	725	896
Retention	Acres	277	235	277	171	128	235	363
Partial Retention	Acres	213	149	213	213	277	107	85
Modification	Acres	21	21	21	853	--	299	21
Maximum Modification	Acres	619	896	576	--	832	--	--
1st Decade								
Road Construction	Miles	--	1.0	1.0	2.0	0.5	1.8	0.4
Area Harvested	Acres	--	102	210	240	95	248	25
Programmed Timber Harvest	MBF	--	772	1,783	2,175	826	2,816	73
Area Remaining Undeveloped	%	--	76	53	45	79	44	94
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	448	640	427	576	491	171	21
75-94% of Full Yield	Acres	128	64	107	128	85	43	--
50-74% of Full Yield	Acres	277	256	277	192	43	235	342
30-49% of Full Yield	Acres	--	--	--	--	--	--	64

Cornpatch - 6,762 Acres

Description

History The Cornpatch roadless area was included in both RARE I and RARE II and was considered for Wilderness by the United States Congress. They released the area for multiple-use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 1,109 acres have been affected by development activities.

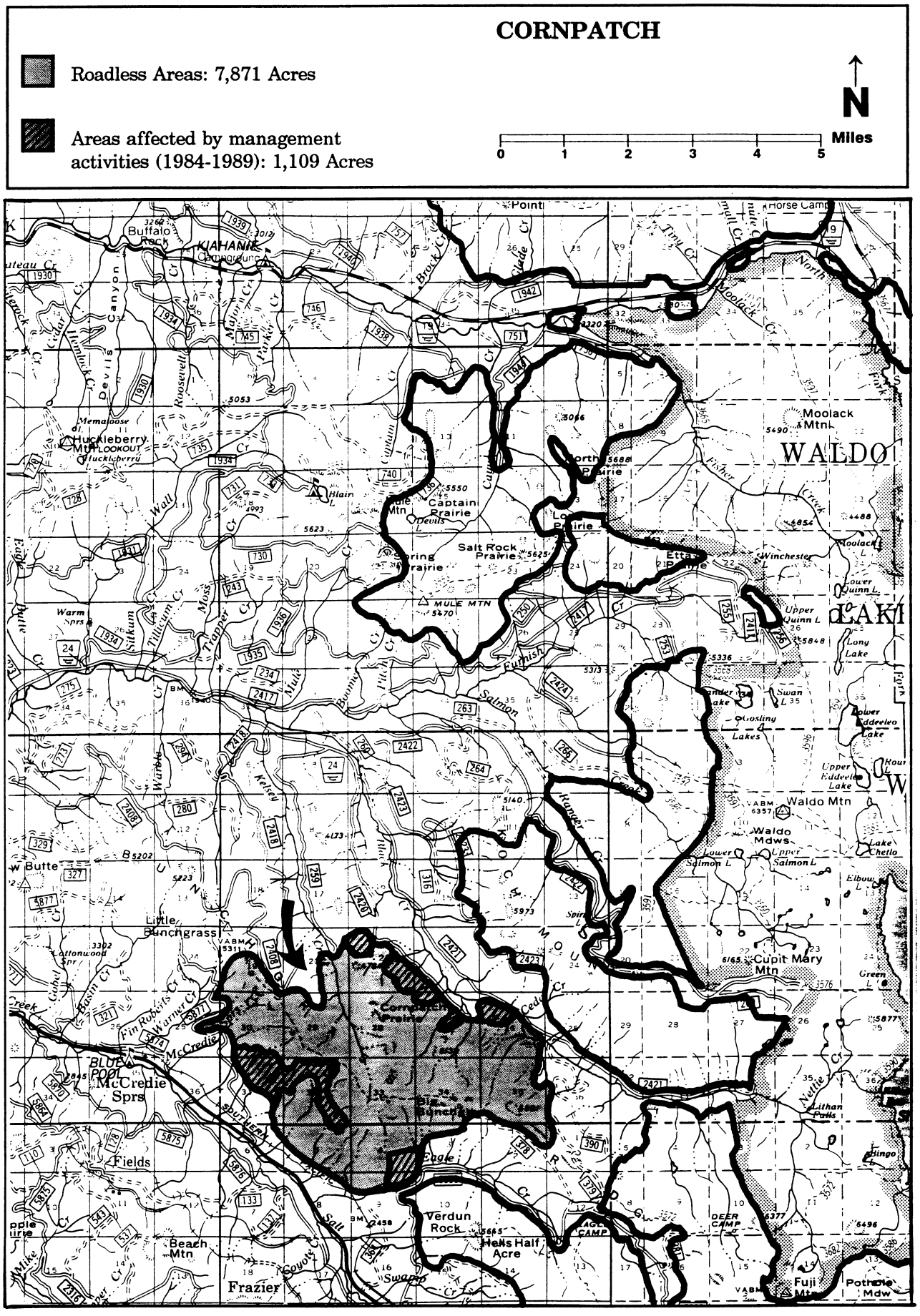
Location and Access The Cornpatch roadless area is in Tps.21 and 22S., R.5E., Lane County, within the Oakridge Ranger District, approximately 12 miles east of the City of Oakridge. It is accessed by a number of Forest Roads 5877352, 5800360, 5877, 2408, 2400259, 2420, 2421, 2421390, 5883378, and 5883379. The Bunchgrass Ridge/Eugene to Crest Trail also traverses the area from northwest to southeast.

Geography and Topography This area consists of a large ridge, Bunchgrass Ridge, that is moderately dissected on its southern side, and is quite steep with many large rock outcroppings. The northern side of this ridge is deeply dissected by many small to large glaciated drainages, the largest of which is the headwaters of Kelsey Creek. Topography on the north side is steep and very rugged to flat in the cirques of the drainage heads. Slopes in the roadless are even to concave. Elevations range from 2,400 to 5,800 feet.

Soil There is a wide variety of soil types, ranging from shallow to nonexistent dry soils in association with the many rock outcrops to deep, moist soils in the cirque basins at the heads of the main drainages, as well as along those drainages. There are about 4,053 acres that have potential for severe surface erosion; and approximately 149 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation About 90 percent of the area is covered by dense forest. Medium to old-growth Douglas-fir forests cover most of the area below 4,500 feet in elevation. Western red cedar and western hemlock are associated with the Douglas-fir, especially on north slopes and along drainages. Above 4,500 feet the forest cover consists of old- growth noble fir and Pacific silver fir. There are many meadows above cliffs on the south side, along ridgetops, and in heads of drainages. The two largest open areas occupy several hundred acres each. Big Bunchgrass Meadows is a grass and forb meadow with a south aspect on top of Bunchgrass Ridge. At the head of Kelsey Creek is the second large opening, consisting of forbs and brush with scattered clumps of Alaska yellow cedar. Below this area there is a stand of old-growth Douglas-fir and western hemlock which contain many unusually large trees. There is also a large cedar/red alder swamp adjacent to Black Creek.

Figure C-30-1


CORNPATCH
Roadless Areas: 7,871 Acres
Areas affected by management activities (1984-1989): 1,109 Acres
N
0 1 2 3 4 5 Miles
WALDO
LAKI
Moolack Mtn.
Huckleberry Mtn.
Mule Mtn.
MULE MTN 5470
Captain Prairie
Salt Rock Prairie
Waldo Mtn
Waldo Mdws.
Cupit Mary Mtn
Little Bunchgrass
McCredie Sprs
Fields
Beach Mtn
Frazier
Verdun Rock
Hells Half Acre
Fuji Mtn.
Potrero Mdw
Buffalo Rock
KIAHANIE
Horse Camp
Fisher Creek
Moolack Creek
Wall Creek
Mule Creek
Salmon Creek
Runner Creek
Kelsey Creek
Warner Creek
Fin Roberts Creek
Spur Creek
Eagle
Upper Quinn L.
Lower Quinn L.
Long Lake
Swan L.
Gosling Lakes
Lake Chetlo
Upper Salmon L.
Lower Salmon L.
Deer Camp
Lithan Parks
Mingo
Green L.
Elbow L.
Winchester L.
Moolack L.
Upper Eddeeleo Lake
Lower Eddeeleo Lake

Ecosystem There is one major potential vegetation zone and two vegetation communities according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock *(Abies-Tsuga)* forest (004) and Pacific silver fir/Douglas-fir *(Abies- Pseudotsuga)* forest (003).

Current Uses Current management direction (FLMP 1977) provides for varying intensities of commercial forest management. Approximately 540 acres of timber harvest have occurred involving construction of 4.2 miles of road since this area was first studied for Wilderness designation. Recreational use includes hiking and hunting. Since this area was inventoried in 1984 management activities are estimated to have affected
320 acres of the area.

Appearance The dense old-growth forest cover, large meadows, large extensive rock outcrops, and deeply dissected topography make this a very attractive area.

Surroundings This area is separated by roads and timber harvests from other roadless areas to the northwest, west, and south. Areas to the southwest, west, and north are being intensively managed for timber production.

Attractions This area holds many attractions of a scenic or ecological nature. There are many high waterfalls in the drainages that flow into Black Creek. Black Creek itself provides good trout fishing experiences. Kelsey Ridge is a very rugged and steep ridge that provides many spectacular views. Big Bunchgrass Meadows and the large meadow in Kelsey Creek provide wildlife viewing and unusual plant communities, and the south slopes of Bunchgrass Ridge provide a spectacular view from State Highway 58 as well as some of the most challenging cross-country travel in the area.

Capability

Manageability and Boundaries These boundaries could easily be adjusted to exclude the development that has occurred and would provide easily managed primitive character.

Natural Integrity There are harvest units along the borders at the lower elevation, and some small units at the higher elevations of the roadless area.

Apparent Naturalness Noise from harvest activities and State Highway 58 would be an intrusion at times. The roadless area is viewed as natural by many visitors, but unnatural impacts are apparent to some.

Opportunity for Solitude Very diverse topography contributes to solitude of the recreation experience by screening in at least half of the area.

Opportunity for Primitive Recreation There is opportunity for ski touring, backpacking, hiking, hunting, riding, rock climbing, and camping.

Challenging Experiences Cross-country hiking on the steep south slopes of Bunchgrass Ridge would provide excitement and adventure.

Special Features Big Bunchgrass Meadow is an interesting feature ecologically and historically. Several sensitive plant species occur in the area including *Calypso bulbosa*, *Eburophyton austinae*, and *Hypopitys monotropa*, with a high potential for others. Lithic scattering are found along the ridge and there is an archaeological site in the meadow area. Evidence of a prehistoric rock carin is located near

Cornpatch Prairie. Evidence of historic sheepherding activity is indicated by occasional debris and several tree carvings. Cornpatch Prairie is also the site of a historic trailway for sheep travel. Evidence of sheep grazing is apparent in both Big Bunchgrass Meadow and Cornpatch Prairie. No federally listed threatened or endangered species are known to be present.

Availability

Resource Potentials

Livestock Resource There is some potential for domestic livestock in Bunchgrass Meadows and good potential for recreation stock use.

Timber Resource The roadless area includes about 4,885 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 232 million board feet. If stands are converted to a managed condition, biological potential yield will be 638,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Wildlife Resource Moderate big game winter use occurs on the south slopes above Salt Creek and the portions extending to the Black Creek floodplain. Heavy summer range use, involving at least two major elk herds, (100 to 125 animals) occurs along the Bunchgrass Ridge/Meadow complex and the headwaters of Kelsey Creek. Timber harvest in the summer range would increase forage, but steep terrain and added disturbance from new road systems would probably combine to create a net loss in available habitat. Thermal cover on the winter range has been impacted by prior timber management activities, and future harvests should be designed to alleviate imbalances of forage/cover ratios in the subdrainages involved. Old-growth dependent species habitat would be reduced by timber harvest.

Recreation Resource Capacity estimates indicate that this area could provide 4,401 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors. No potential developed recreation sites have been identified.

Cultural Resources Prehistoric sites have been identified. The majority of these sites are located along Bunchgrass Ridge. Most likely these represent upland seasonal camps and work stations along an aboriginal trail system. Potentially there is a high probability of finding more significant prehistoric sites on the ridges, alluvial flats, and benches. In addition, there are remnant artifacts of the late nineteenth century and early twentieth century sheepherding and Forest administrative activities.

Management Consideratins

Fire There have been 18 spot fires since 1943. The fuel type spread rate is medium to high. Fuel loading ranges from five to 150 tons per acre.

Insect and Disease Two areas of bark beetle damage are located at Big Bunchgrass and along a three mile section of the Bunchgrass Trail.

Need

Nearby Wilderness and Its Use The Cornpatch roadless area is four miles west of Waldo Lake Wilderness (37,157 acres) and ten miles northwest of the Diamond Peak Wilderness (53,773 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 50 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Cornpatch roadless area generated a low amount of interest with 56% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Cornpatch roadless area. In Alternatives NC, K, A, J, and D, 70 to 100% of this area will be affected by road construction and timber harvest. Alternative W develops 54% of the area and Alternative L develops 10%. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives except Alternative L, will alter the suitability of this area for future Wilderness consideration. Alternative L maintains the option of future Wilderness consideration for this area. Figure C-30-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Cornpatch roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, D, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternative L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-30-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-30-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	5,887
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	192	--	21
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	1,429	1,429	1,429	1,386	1,429	128
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	64	64	64	64	64	--
Management Area **9d**	--	--	--	--	1,216	213	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	--	--	--	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	747	--	533	512	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	1,024	--	640	1,216	640	469
Management Area **11d**	299	384	299	1,152	--	1,130	--
Management Area **11e**	533	--	256	--	--	--	192
Management Area **11f**	341	--	149	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	5,588	2,816	4,266	2,666	1,941	2,986	--
15 Riparian [2]							
Management Area **15**	*	299	299	278	235	299	64

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-30-3. Cornpatch Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	5,887
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	1,606	6,768	6,793	10,424	12,374	11,757	2,742
	Acres	1,173	3,200	2,496	3,562	4,309	3,775	875
Roaded Modified	RVDs	7,309	5,354	5,316	3,911	3,095	3,380	--
	Acres	5,588	3,562	4,266	3,199	2,453	2,986	--
Trails								
Existing Trails								
Full Protection Level	Miles	3.0	4.0	4.0	4.0	--	4.0	6.0
Moderate Protection Level	Miles	2.0	1.0	2.0	2.0	6.0	2.0	--
Low Protection Level	Miles	2.0	2.0	1.0	--	--	0.0	--
Potential Trails								
Full Protection Level	Miles	1.0	1.0	1.0	1.0	0.0	2.0	3.0
Moderate Protection Level	Miles	--	1.0	1.0	1.0	3.0	1.0	--
Low Protection Level	Miles	3.0	1.0	1.0	1.0	--	1.0	--
Visual Quality Objectives								
Preservation	Acres	--	1,493	1,493	1,493	1,642	1,493	6,036
Retention	Acres	875	--	405	--	1,216	213	192
Partial Retention	Acres	299	1,706	597	2,069	1,450	2,069	533
Modification	Acres	--	747	--	533	512	--	--
Maximum Modification	Acres	5,588	2,816	4,266	2,666	1,941	2,986	--
1st Decade								
Road Construction	Miles	--	4.0	4.0	2.0	2.2	6.9	0.3
Area Harvested	Acres	--	618	788	338	471	1,148	55
Programmed Timber Harvest	MBF	--	4,584	5,929	2,527	3,689	11,702	379
Area Remaining Undeveloped	%	--	72	64	85	79	48	97
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	4,010	3,157	2,837	2,709	256	2,496	171
75-94% of Full Yield	Acres	640	363	619	811	43	747	--
50-74% of Full Yield	Acres	235	85	149	85	64	192	192
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Charlton Butte - 2,880 Acres

Description

History The Charlton Butte roadless area was studied in RARE I and RARE II on both the Willamette and Deschutes National Forests, and was considered for Wilderness by the United States Congress. On the Willamette National Forest, they released the area for multiple-use management in the Oregon Wilderness Act of 1984. The Deschutes National Forest's portion of the roadless inventory includes 7,243 acres which is adjacent to the Charlton Butte roadless area.

Location and Access This area includes portions of Tps.20 and 21S., R.6E., in Lane County. It is within the Oakridge Ranger District and is approximately 26 miles east of the town of Oakridge. The area is accessed by Forest Road 5897 and is northeast of Waldo Lake. The Pacific Crest Trail provides access into the interior.

Geography and Topography Elevations range from 5,100 to 6,600 feet above sea level. Slopes are gentle to moderate and even except near the summit of Charlton Butte. There are no permanent streams but there are numerous pothole lakes of glacial origin. The dominant feature is Charlton Butte, a moderate sized cinder cone.

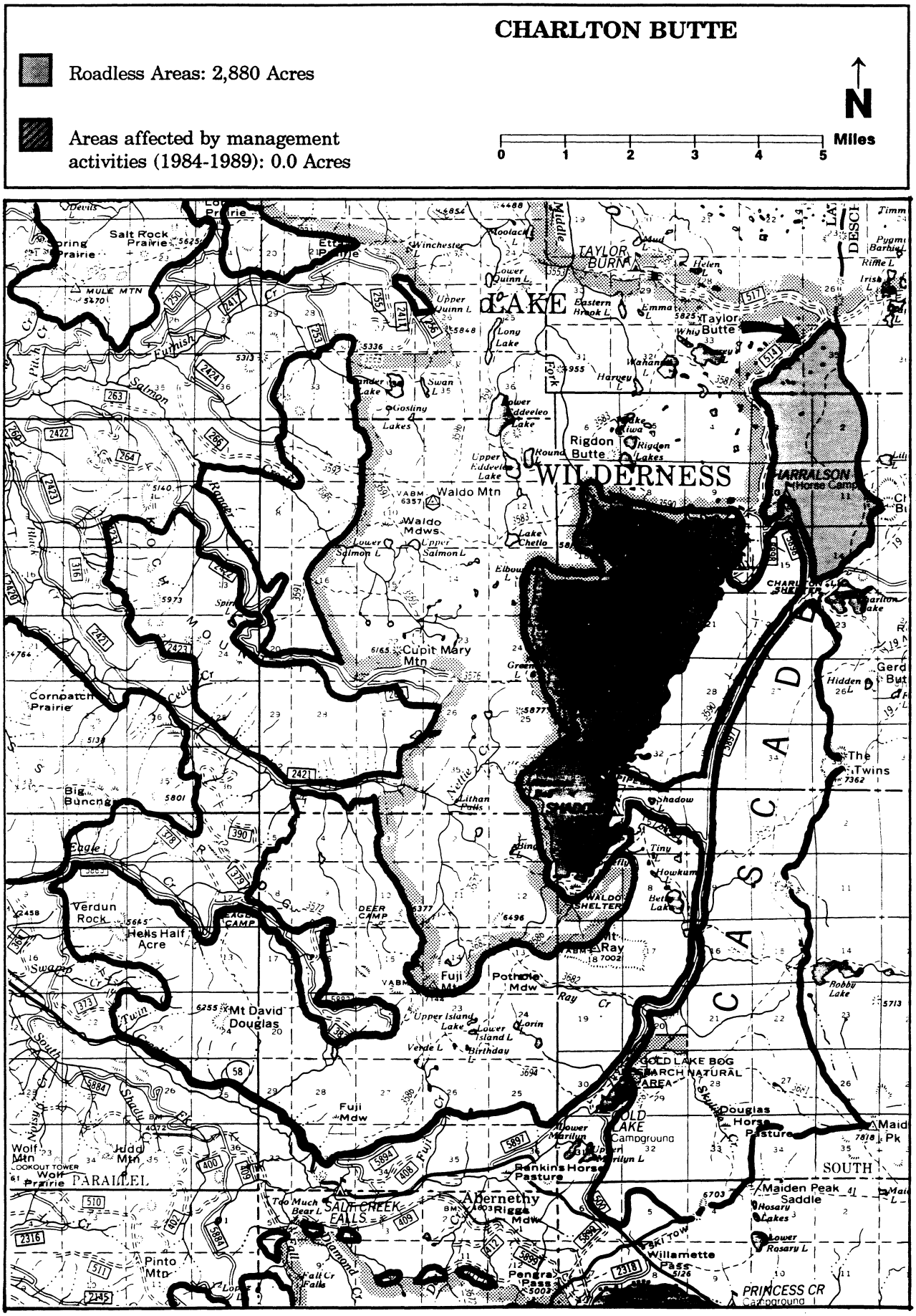
Soil Soils are shallow to moderate in depth and are composed of glacially modified lava overlain by pumice. Fertility is low to moderate with 30% of the area containing rock outcrops. There are about 21 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Vegetation is not diverse, being primarily stands of mountain hemlock and lodgepole pine with little understory vegetation.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock (*Abies-Tsuga*) forest (004).

Current Uses Current management direction provides unroaded recreational use. The area is used by hikers, primarily traversing the area via the Pacific Crest Trail. There is also some horse riding centered around a horse camp in the southwestern portion.

Figure C-31-1


CHARLTON BUTTE
Roadless Areas: 2,880 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
CASCADES
Waldo Mtn
Cupit Mary Mtn
Rigdon Butte
Taylor Butte
Fuji Mtn
Mt Ray
Mt David
Douglas
Abernethy
Pinto Mtn
Wolf Mtn
Judd Mtn
Maiden Peak
Saddle
Willamette Pass
PRINCESS CR
Campground
SOUTH
PARALLEL
Fuji Mdw
Riggs Mdw
Pothole Mdw
Waldo Mdws
Cornpatch Prairie
Salt Rock Prairie
Big Buncng
Verdun Rock
Hens Half Acre
TAYLOR BURN
LAKE
Lake Chetlo
Lithan Falls
SALT CREEK FALLS
Diamond Cr
Fall Cr Falls
Too Much Bear L
Rankins Horse Pasture
Douglas Horse Pasture
OLD LAKE Campground
OLD LAKE BOG ARCH NATURAL AREA
WALDO SHELTER
DEER CAMP
EAGLE CAMP
HARRALSON Horse Camp
The Twins
Maid Pk
Robby Lake
Hidden Lake
Tiny Lake
Shadow Lake
Rosary Lakes
Lower Rosary L
Gosling Lakes
Upper Quinn L
Lower Quinn L
Eastern Brook L
Emma L
Lony Lake
Harqeu L
Wahanna L
Upper Island Lake
Lower Island L
Verde L
Birthday L
Lower Marilyn L
Upper Marilyn L
Lower Salmon L
Upper Salmon L
Swan L
Lower Hoddevelea Lake
Upper Hoddevelea Lake
Round Lake
Elbow L
Green L
Hawkum L
Beth Lake
Robinson Cr
Nettle Cr
Cedar Cr
Ramsey Cr
Swamp Cr
Eagle Cr
Twin Cr
South Fk Salmon R
Middle Fk
Fork
Pitch Cr
Thick Cr
Spire L
Lorin
Pygmy Barrel
Rifle L
Irish L
Timm
DESCH
Gerd But
Maid Pk
Lower L
Mule Mtn
Devils L
Winchester L
Roolack L
Mud L
Helen L
Whiy L
Waldo Mtn
Pengra Pass
Lookout Tower
Wolf Prairie
Nursery Cr
Shady Fk
Fuji
Ray Cr
Salmon
Fuji
Twin
South
Eagle
Thick
Pitch
Cr
Fk
R
L
Mdw
Mtn
Pk
Cr
Fall
Falls
Lake
Lakes
Pass
Saddle
Meadow
Prairie
Spring
Butte
Creek
River
Fork
Lookout
Tower
Campground
Horse
Pasture
Natural
Area
Bog
Arch
Shelter
Camp
Trail
Road
Forest
Service
Boundary
Wilderness
Roadless
Area
Management
Activities
Acres
Miles
North
South
East
West
Scale
Figure
Map
Legend
Key
Note
Source
Data
Information
Analysis
Environmental
Impact
Statement
Final
Draft
Supplement
Alternative
Preferred
Proposed
Action
No
Yes
Yes
No
Yes
No
Yes
No

Appearance The area generally appears to be densely forested, with little variety in topography except for the relief of Charlton Butte.

Surroundings The Charlton Butte roadless area is separated on the west from the Waldo Lake and Three Sisters Wildernesses by a primitive road. The southern boundary is comprised of a paved access road into Waldo Lake. The area is contiguous with a roadless area on the Deschutes National Forest on the eastern boundary.

Attractions The Pacific Crest Trail is the main attraction.

Capability

Manageability and Boundaries This area could easily and efficiently be managed as Wilderness, especially if the adjacent roadless area on the Deschutes were also managed as Wilderness. Transportation access is provided by the Taylor Burn Road.

Natural Integrity There are five miles of developed trails in the roadless area. The area is snowbound nine months of the year. Natural processes continue to operate uninterrupted.

Natural Appearance This area appears natural to visitors once they are away from the roaded boundaries and the trail.

Opportunity for Solitude Though there is little in the way of topographic screening, the dense forest cover provides excellent screening for a short distance. The distance from the perimeter to the center is over three miles. Offsite intrusions in the form of road and railroad noise are occasionally perceptible, but relatively distant and generally not permanent.

Opportunity for Primitive Recreation In winter, there are good opportunities for snowshoeing or cross-country touring.

Challenging Experiences This area offers the challenge of orienteering through featureless terrain, as well as the ascending of Charlton Butte.

Special Features This area has no outstanding known features other than being adjacent to the Taylor Burn Road which was the early access route to Waldo Lake until 1967. No federally listed endangered or threatened species are known to be present. Researchers have used the area for several different studies of this typical mountain hemlock forest. Such studies include growth and yield of mountain hemlock stands, mortality in subalpine forest ecosystems, and the vegetation of Torrey Lake mire.

Availability

Resource Potentials

Water Resource An underground pipe through the southern corner carries drinking water from Charlton Lake, which is on the Deschutes National Forest, to North Waldo and Islet Campgrounds.

Livestock Resource There is no potential for grazing domestic stock. Recreation stock use has high potential, due to a horse camp located on the edge of the area, open woods, and developed trails in the area.

Timber Resource The roadless area includes about 2,858 acres of land suitable and available for growing timber under managed conditions. Stands of mature lodgepole pine, true firs, and mountain hemlock occupy the area representing about 95 million board feet. If stands are converted to a managed condition, biological potential yield will be 223,700 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining 22 acres are unsuitable or unavailable.

Wildlife Resource The Charlton Butte roadless area provides moderately used summer range for big-game animals. Winter use by wolverine is likely.

Recreation Resource Capacity estimates indicate that this area could provide 2,124 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide for access and disperse visitors. Potential developed recreation sites have been identified.

Cultural Resources This area is virtually unknown archeologically or historically. Historically the area received use around the turn of the century by sheepherders. There are a few potential areas with high probability for locating prehistoric sites. These would occur near ponds that are scattered in the northern end of the area.

Management Consideration

Fire There have been only three fires since 1943. Spread rate for fuel type is medium. Fuel loading ranges from five to 30 tons per acre.

Insect and Disease Laminated root rot and hemlock rot disease are prevalent in all mountain hemlock stands of this area.

Need

Nearby Wilderness and Its Use The Charlton Butte roadless area is across the Taylor Burn Road to the east of the Waldo Lake Wilderness (37,157 acres), and south of the Three Sisters Wilderness (283,539 acres) just across the Irish and Taylor Lakes Road. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 75 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Charlton Butte roadless area generated a low amount of interest with 83% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Charlton Butte roadless area. In Alternative K, 7% of this area will be affected by timber harvest. The other Alternatives will develop less than 1%. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. All Alternatives maintain the option of future Wilderness consideration for most of the area, depending on the allocation of adjoining roadless lands in the Deschutes National Forest FEIS. Figure C-31-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Charlton Butte roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-31-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-31-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	2,858
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	1,130	1,173	1,130	1,152	1,130	1,194	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	1,493	--	--	--	--	--
Management Area **10c**	--	--	--	107	149	107	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	1,728	--	1,728	1,600	1,578	1,557	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	192	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	21	21	21	21	21	21	21
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	--	--	--	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-31-3. Charlton Butte Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	2,858
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	3,366	1,377	3,366	3,240	3,189	3,240	--
	Acres	2,858	1,173	2,858	2,752	2,709	2,752	--
Semiprimitive Motorized	RVDs	--	4,539	--	324	454	324	--
	Acres	--	1,493	--	107	149	107	--
Roaded Natural	RVDs	243	2,470	247	247	247	247	247
	Acres	21	213	21	21	21	21	21
Roaded Modified	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	6.0	10.0	6.0	6.0	6.0	6.0	6.0
Moderate Protection Level	Miles	--	1.0	--	--	--	--	--
Low Protection Level	Miles	--	8.0	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	2.0	4.0	2.0	2.0	2.0	2.0	2.0
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	4.0	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	2,858	1,173	2,858	2,752	2,709	2,752	2,858
Retention	Acres	--	192	--	107	149	107	--
Partial Retention	Acres	21	1,514	21	21	21	21	21
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	--	--	--	--	--	--	--
1st Decade								
Road Construction	Miles	--	2.0	--	--	--	--	--
Area Harvested	Acres	--	179	--	--	--	--	--
Programmed Timber Harvest	MBF	--	1,355	--	--	--	--	--
Area Remaining Undeveloped	%	--	80	--	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	--	--	--	--	--	--	--
75-94% of Full Yield	Acres	--	1,493	--	--	--	--	--
50-74% of Full Yield	Acres	--	192	--	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Maiden Peak - 11,070 Acres

Description

History The Maiden Peak roadless area was studied in RARE I and RARE II on both the Willamette and Deschutes National Forests, and was considered for Wilderness by the United States Congress. On the Willamette National Forest, they released the area for multiple-use management in the Oregon Wilderness Act of 1984. The Deschutes National Forest's portion of the roadless inventory includes 27,008 acres which is adjacent to the Maiden Peak roadless area.

Location and Access The Willamette's portion of the area is within Tps.21, 22, and 23S., R.6E., in Lane County on the Oakridge Ranger District. It is approximately 25 miles south and east from the city of Oakridge and is accessed by Forest Roads 5897, 5800500, and State Highway 58 and by the Pacific Crest Trail, as well as three other trails (Forest Trails 3663, 3677, and 3595) that leave from Forest Road 5897. From Gold Lake access is by Forest Trail 3681.

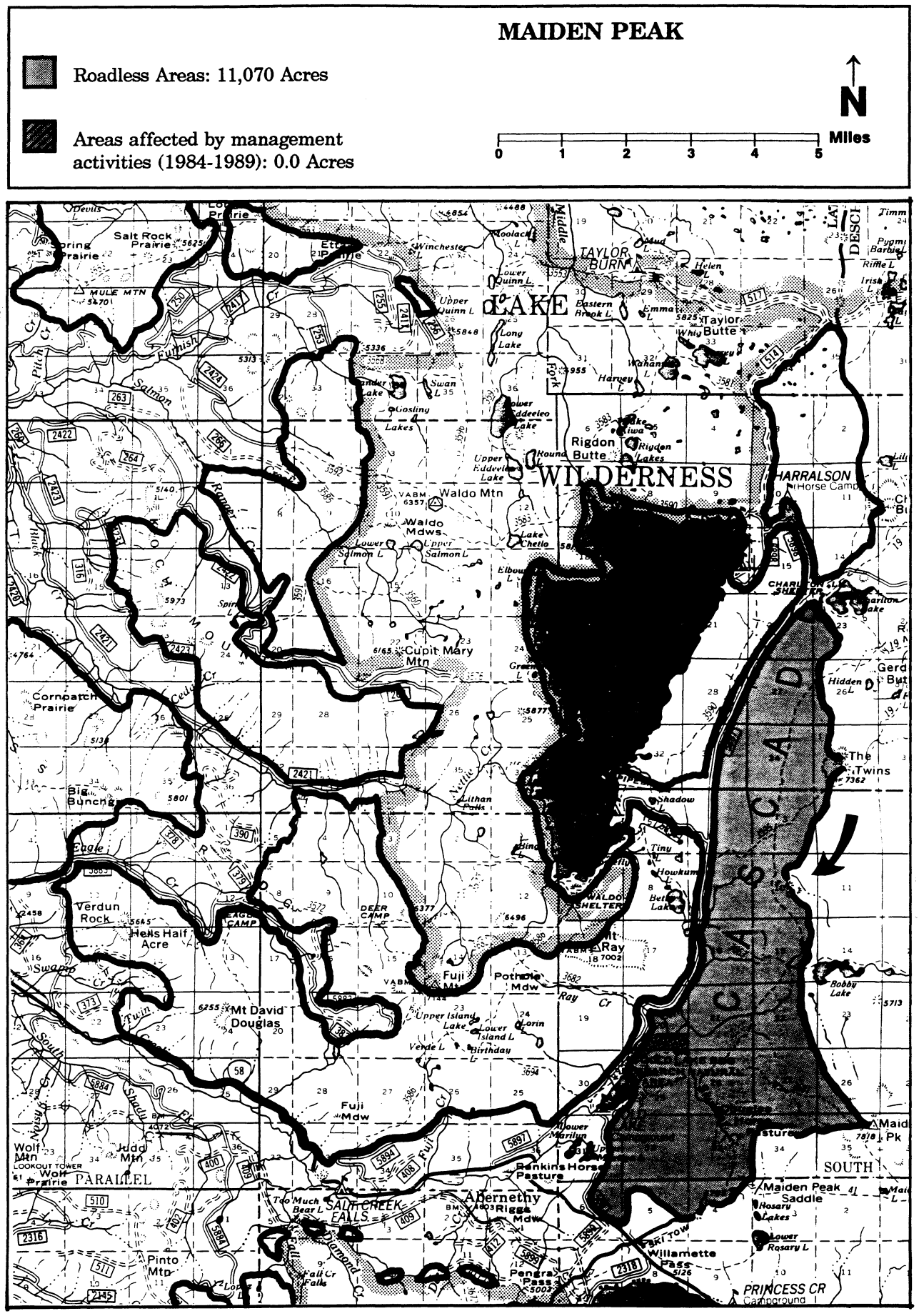
Geography and Topography This area borders the Pacific Crest and is part of the High Cascade Plateau. Topography is gentle and rolling with steep concave to even slopes occurring in the south end and on the upper portions of two quite recent volcanic peaks (Maiden Peak and the Twins). Elevations range from 5,040 to 7,820 feet at the summit of Maiden Peak. There are numerous streams and many small pothole lakes in the south half and a few in the northern portion.

Soil Soils are glacial material overlain by deposits of Mazama pumice. There are about 1,173 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation These soils support diverse vegetation types, depending upon ground water levels. The wettest areas support meadow vegetation, the biggest and most unique of which is Gold Lake Bog. Dense stands of true firs and Englemann spruce occupy the wetter forest area, mountain hemlock and lodgepole pine stands cover the drier slopes. Vegetation on the west side of the Twins has been influenced by several large prehistoric fires. These areas are occupied by young, open stands of lodgepole pine and mountain hemlock. Forests here are generally quite park like with little understory vegetation existing except along riparian areas.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock (*Abies-Tsuga*) forest (004).

Figure C-32-1


MAIDEN PEAK
Roadless Areas: 11,070 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
0 1 2 3 4 5 Miles
WILDERNESS
SOUTH
Waldo Mtn
Cupit Mary Mtn
Rigdon Butte
Taylor Butte
Mt David Douglas
Fuji Mtn
Fuji Mdw
Pothole Mdw
Ray
Judd Mtn
Wolf Mtn
Pinto Mtn
Abernethy
Rigdon Mdw
Maiden Peak
Saddle
Willamette Pass
Pengra Pass
The Twins
Verdun Rock
Big Bunching
Cornpatch Prairie
Salt Rock Prairie
Gosling Lakes
Waldo Mdws
Rigdon Lakes
Taylor Burn
Lake
Harralson Horse Camp
Waldo Shelter
Deer Camp
Eagle Camp
Parallel
Princess Cr Campground
Salt Creek Falls
Diamond Cr
Fall Cr Falls
Ski Tow
Lookout Tower
Mule Mtn
Pitch Cr
Salmon
Furnish
Swamp
Twin
South
Shady
Ray Cr
Fuji
Rainey
Eagle
Nellie
Cedar
Hackleman
Black
Spring
Devils
Middle
Lithan Falls
Too Much Bear L
Lower Marilun
Rankins Horse Pasture
Lower Rosary L
Rosary Lakes
Shadow L
Tiny
Hawkum
Bobby Lake
Hidden
Gerd
Buf
Irish
Rime L
Pygmy Barbie
Timm
Lower Quinn L
Upper Quinn L
Long Lake
Eastern Brook L
Emma L
Helen L
Harvey L
Swan L
Lower Eddeleo Lake
Upper Eddeleo Lake
Lake Chetlo
Lower Salmon L
Upper Salmon L
Elbow L
Green L
Lithan Falls
Upper Island Lake
Lower Island L
Verde L
Birthday
Lorin
Hells Half Acre
Swamp
Twin
Shady
Wolf Mtn
Judd Mtn
Pinto Mtn
Maiden Pk
Bobby Lake
Hidden
Tiny
Hawkum
Shadow L
Rosary Lakes
Lower Rosary L
Willamette Pass
Pengra Pass

Current Uses Current management direction is for roadless recreation with a Recreation Opportunity Spectrum (ROS) class of Semiprimitive Nonmotorized. Primary uses include hiking, cross-country skiing, downhill skiing, and sight seeing along Road 5897. In addition, there is some hunting and trail bike riding. There is a Research Natural Area (RNA) established around Gold Lake Bog which has been used for scientific study. Since this area was inventoried in 1984 management activities have affected a small portion of the area near Willamette Pass Ski area.

Appearance The area is covered with an essentially unbroken forest cover. With the exception of a few lakes and meadows, it appears to be quite natural.

Surroundings The area is bordered on the east by roadless areas in the Deschutes National Forest and is separated by Forest Road 5897 from the Fuji and Waldo-Lake roadless areas. The south end is adjacent to State Highway 58 and the Willamette Pass Ski Area.

Attractions The major attractions are the Willamette Pass Ski Area, the Pacific Crest Trail, and Gold Lake Bog, which contains several unique plant and animal species. Maiden Peak is the highest point on the Oakridge Ranger District.

Capability

Manageability and Boundaries Existing boundaries can be easily and efficiently managed for wilderness resouces. The entire eastern boundary is contiguous with the large roadless area on the Deschutes National Forest.

Natural Integrity A short stretch of buried water supply line in the northern tip, a weather station and associated access road (1/4 mile long), 24 miles of trail and 200 acres of the Willamette Pass Ski Area on the southern tip occur in the area. The area is snowbound and virtually undisturbed for nine months of the year, except for some snow oriented recreation.

Natural Appearance Most visitors find this roadless area apparently natural. Evidence of unnaturalness is apparent only in localized areas.

Opportunity for Solitude Opportunities for solitude are good. Though there is only a moderate amount of topographic screening to the generally gentle terrain, the vegetation is usually dense enough to screen objects and people within several hundred feet. The distance from the perimeter to its approximate center is three to five miles. Offsite intrusions, mostly in the form of road, highway, and railroad noise are occasionally perceptible but are relatively distant.

Opportunity for Primitive Recreation Ascent of Maiden Peak and traversing relatively featureless terrain provide the most challenging recreation opportunities. Abundant primitive recreation opportunities exist for back country travel, as well as winter travel by snowshoe or cross-country skiing.

Special Features Gold Lake Bog is the most unique feature and several scientific studies have resulted in designating the bog and its surroundings as a Research Natural Area. The Gold Lake sphagnum bog supports a number of uncommon and carnivorous plant species, including two species of sundew and three species of bladderwort. Two of these are on the 1985 review list for the State of Oregon. No federally listed threatened or endangered plants are known to be present.

Availability

Resource Potentials

Livestock Resource There is no potential for long term domestic livestock, but, good potential for recreation stock use.

Timber Resource The roadless area includes about 6,036 acres of land suitable and available for growing timber under managed conditions. Stands of mature true firs, lodgepole pine, and mountain hemlock occupy the area representing about 272 million board feet. If stands are converted to a managed condition, biological potential yield will be 564,900 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining 5,034 acres are unsuitable or unavailable.

Wildlife Resource The Maiden Peak roadless area encompasses a Research Natural Area and a 747 acre portion of a Spotted Owl Habitat Area. Summer big game use is high. Occurring primarily in the Gold Lake-Douglas Horsepasture area. Substantial winter wolverine use has been documented in the same area. A moderate fishery and some waterfowl use occurs in the Gold Lake Bog. Occasional bald eagle and Northern spotted owl use has been noted around Gold Lake. The spotted frog also occurs in the bog.

Recreation Resource Capacity estimates indicate that this area could provide 6,981 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trail locations have been identified.

Three potential developed sites have been identified including one observation site and two downhill skiing sites. The potential observation site is one acre in size and could accommodate 50 Persons-At-One-Time (PAOT) and provide 3,080 RVDs annually. Of the two downhill skiing sites, one represents expansion potential of the existing Willamette Pass Ski Area, and the other is a potential new site at Maiden Peak.

The Willamette Pass Ski Area site is 700 acres and could accommodate 4,517 PAOT and provide 216,816 RVDs annually. The potential Maiden Peak site is 600 acres and could accommodate 3,000 PAOT and provide 168,000 RVDs annually.

Cultural Resources The Maiden Peak roadless area contains high potential for artifacts and sites around prominent lakes and bogs in the area. There are numerous ponds throughout the area combined with a variety of upland food resources such as huckleberries, pond lilies (wocus), seeds, and game. Historic use centered around sheep herding and Forest Service administration. There is a reported obsidian source and lithic scatter in the area.

Surveys have been made in conjunction with the development of the ski area.

Management Considerations There have been 23 spot fires since 1943. Spread rate for the fuel type is low to medium. Fuel loadings range from five to 30 tons per acre.

Need

Nearby Wilderness and Its Use The Maiden Peak roadless area is within one mile of the Waldo Lake Wilderness (37,157 acres) and is three miles north of the Diamond Peak Wilderness (53,773

acres). Refer to Chapter III for the amount of use these Wildernesses receive. This roadless area is also adjacent to the Deschutes National Forest's Maiden Peak roadless area.

Distance from Population Centers The area is approximately 60 miles by highway to the southeast of Eugene, Oregon.

Interest by Proponents The Maiden Peak roadless area generated a moderate amount of interest with 85% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Maiden Peak roadless area. In Alternatives NC, K, A, J, L, and W, 4 to 16% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. All Alternatives maintain the option of future Wilderness consideration for this area. Figure C-32-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Maiden Peak roadless area, an array of goods and services are provided. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in all Alternatives. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-32-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-32-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	9,876
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	469	469	469	469	469	469	469
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	256
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	8,788	--	--	--	--	--
Management Area **10c**	--	--	--	597	917	619	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	10,132	--	10,132	9,535	9,193	9,492	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area	--	1,344	--	--	21	21	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	469	469	469	469	469	--	469
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	--	--	--	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-32-3. Maiden Peak Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	9,876
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	10,148	384	10,148	9,479	9,076	9,429	384
	Acres	10,601	469	10,601	10,004	9,662	9,961	469
Semiprimitive Motorized	RVDs	--	20,964	--	1,718	2,691	1,783	--
	Acres	--	8,788	--	597	917	619	--
Roaded Natural	RVDs	5,063	20,327	5,063	5,063	5,310	5,310	8,027
	Acres	469	1,813	469	469	491	491	725
Roaded Modified	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	26	12	26	26	26	26	26
Moderate Protection Level	Miles	--	13	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	10,601	469	10,601	10,004	9,662	9,961	10,601
Retention	Acres	--	1,344	--	597	939	640	--
Partial Retention	Acres	469	9,257	469	469	469	469	469
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	--	--	--	--	--	--	--
1st Decade								
Road Construction	Miles	--	4.0	--	--	0.1	0.1	--
Area Harvested	Acres	--	491	--	--	--	--	--
Programmed Timber Harvest	MBF	--	3,729	--	--	30	94	--
Area Remaining Undeveloped	%	--	86	--	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	--	--	--	--	--	--	--
75-94% of Full Yield	Acres	--	4,415	--	--	--	--	--
50-74% of Full Yield	Acres	--	1,258	--	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Hardesty Mountain - 3,690 Acres

Description

History Hardesty Mountain roadless area was first studied in RARE II and was considered for Wilderness by the United States Congress. They released 4,031 acres for multiple use management in the Oregon Wilderness Act of 1984. Since the release of these lands in 1984, approximately 341 acres have been affected by development activities. The area is contiguous to 2,555 acres of Hardesty Mountain roadless area on the Umpqua National Forest making a total of 6,245 acres.

Location and Access This area is located in Lane County approximately 26 miles southeast of Eugene, on the Lowell Ranger District in T.20S., R.1E. The roadless area is accessible from State Highway 58 and by Forest Trails 3469 and 3463.

Geography and Topography Elevation ranges from 1,000 feet on the north to 4,279 feet on the top of Hardesty Mountain. The mountain is characterized by steep dissected slopes, high peaks, and ridges with some small bench areas on ridgetops.

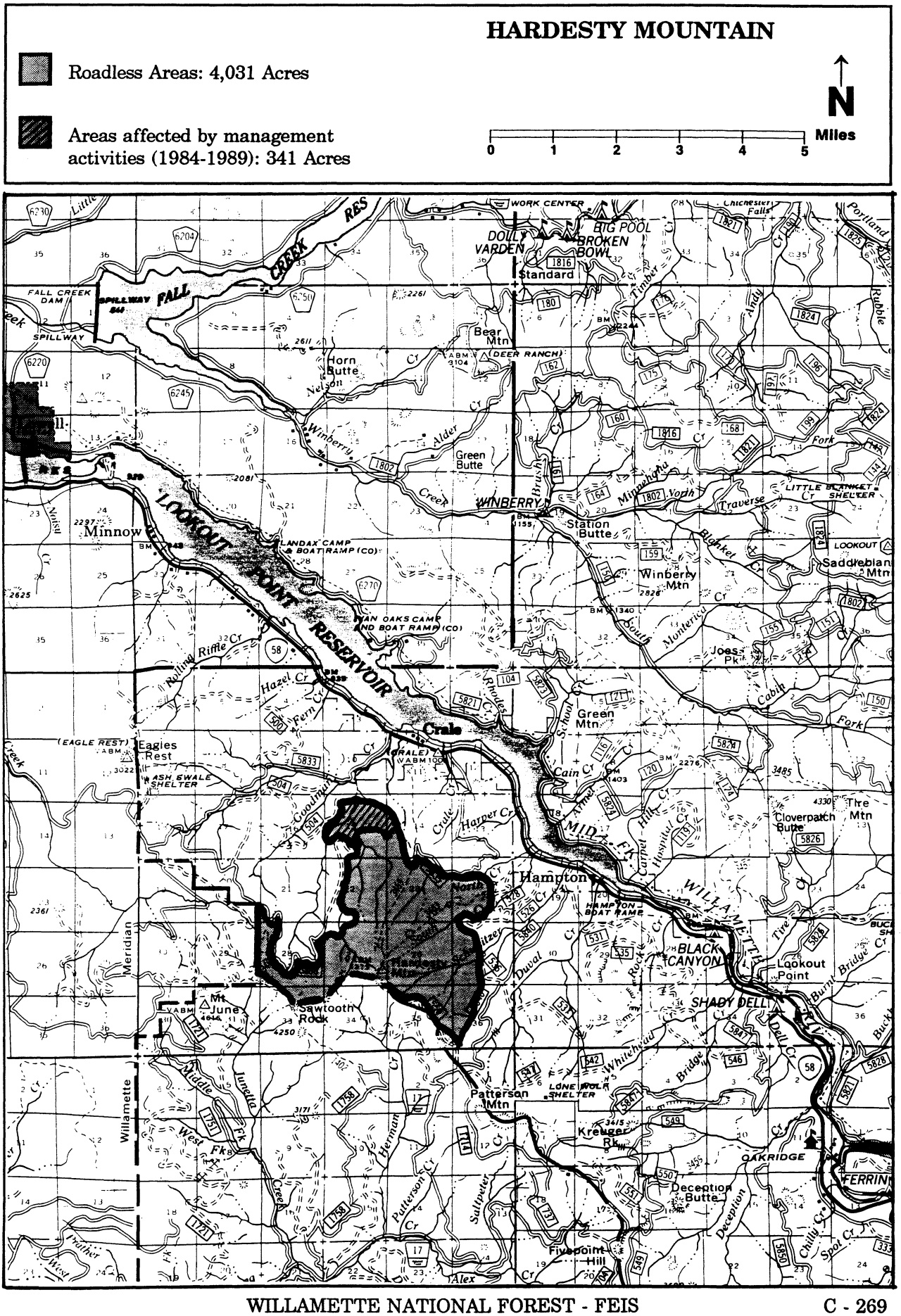
Soil The soils are shallow and locally coarse textured, low in fertility and moisture with local debris slides and channel scouring. There are about 3,157 acres that have potential for severe surface erosion; and approximately 384 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation Most of the area has a continuous forest canopy of timber, principally of the Douglas-fir/ western hemlock association. Upper elevations have the canopy broken occasionally by meadow openings and rock outcrops.

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses The 1977 Forest Land Management Plan prescribed the majority of the area to be managed as General Forest; there is a 26 acre Old-Growth Grove on the west edge and a fringe of Scenic Influence II on the north edge. Recreation use is by hikers and hunters. The low elevation provides a year-round access to hiking trails such as the Eula Ridge Trail. Black-tailed deer and cougar utilize the area as winter range. Since this area was inventoried in 1984 management activities have affected 42 acres of the area.

Figure C-33-1


HARDESTY MOUNTAIN
Roadless Areas: 4,031 Acres
Areas affected by management activities (1984-1989): 341 Acres
N
0 1 2 3 4 5 Miles
LOOKOUT POINT RESERVOIR
Hampton
Crane
Eagles Rest
Sawtooth Rock
Mt June
Patterson Mtn
Kreuger Rk
Deception Butte
Fivepoint Hill
Green Butte
Horn Butte
Bear Mtn
Winberry Mtn
Station Butte
Green Mtn
Cloverpatch Butte
Saddleblan Mtn
Joss Pk
Tire Mtn
Lookout Point
BLACK CANYON
SHADY DELL
OAKRIDGE
FERRIN
WORK CENTER
DOLLY VARDEN
BIG POOL
BROKEN BOWL
Standard
FALL CREEK DAM
SPILLWAY
DEER RANCH
WINBERRY
LANDAX CAMP & BOAT RAMP (CO)
HAN OAKS CAMP AND BOAT RAMP (CO)
HAMPTON BOAT RAMP
ASH SWALE SHELTER
LONE POLE SHELTER
LITTLE BLANKET SHELTER
Minnow
Meridian
Willamette
Middle Fk
West Fk
MID-A-FK
WILLAMETTE

Appearance The coniferous forest canopy is broken only by an occasional small rock outcrop or meadow. Variation in canopy texture is subtle with a scattering of individual old-growth Douglas-fir and patches of old-growth in smaller timber.
Surroundings The area is bordered by lands being managed for timber productivity, which includes scattered plantations in various age classes on all sides except the south. To the south of the Forest boundary is the contiguous portion of the Umpqua National Forest's Hardesty roadless area. Other than the south, the surrounding area has been salvaged numerous times to remove trees that have blown down. North of the area, the Eula Ridge trailhead provides hiker parking along State Highway 58.

Attractions Hardesty Mountain, elevation 4,279 feet, is a destination point for hikers using the Hardesty and Eula Ridge Trails from the low elevation access on State Highway 58. This is a year round use area for the Willamette Valley population.

The area is drained by small streams such as North Creek, South Creek, and Schweitzer Creek which flow into Lookout Point Reservoir. Native cutthroat trout are found in the lower elevation portions of these streams.

Capability

Manageability and Boundaries Most of this roadless area boundary follows topographic features and roads, and could be efficiently administered for undeveloped recreation management. Adjustment of the boundary down to Forest Roads 5840526, 5840530, and 5840536, while still excluding existing clearcut units, would improve manageability of the northeast boundary.

Natural Integrity Spur roads, clearcuts, roadside salvage, trails, dispersed campsites, and a helspot are present. One spur road rehabilitation project, two helicopter clearcut units, and many roadside salvage areas have occurred near the boundary. Two trails bisect the full length of the area. Five dispersed campsites are located at the top of Hardesty Mountain as well as a helispot with a maintained clearing. Random lightning strikes, causing small fires, have been common. Air pollution in the form of smoke intermittently affects the area. Pheromone confusant (MCH) for bark beetles was applied to the middle section.

Natural Appearance Most viewers find the majority of the area to be apparently natural. Influence on apparent naturalness is evident in the harvested areas, although in time vegetation size would blend in with the surrounding stands of timber. The disturbed areas are located near the north edge.

Opportunity for Solitude Opportunities for solitude are low. Topographic screening is moderate and most of the area has dense vegetation. Use tends to concentrate on trails. Dense vegetation screens people from one another in less than a quarter of a mile. The distance from the perimeter of the roadless area to the approximate geographic center is from one to three miles. Offsite intrusions from roads and timber harvest activities are nearby but are intermittent. Offsite intrusions from railroad and highway noise are permanent because of the commercial nature of each.

Opportunity for Primitive Recreation Opportunities for primitive recreation are moderate with few features other than trails and peaks to experience. Orienteering through dense vegetation and on steep slopes can offer a challenge.

Special Features Both historic and prehistoric archeological sites have been identified. Remnants of the Hardesty Mountain Lookout still remain. No federally listed threatened or endangered species are known to be present.

Availability

Resource Potential

Mineral and Energy Resource As of 1985, three oil and gas leases occur within the Hardesty Mountain roadless area, but no activity is planned at this time. These leases are No. 20720, 20721, 20722. The potential for minerals and energy resources is unknown at this time.

Timber Resource The roadless area includes about 3,157 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 135 million board feet. If stands are converted to a managed condition, biological potential yield will be 455,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Recreation Resource Capacity estimates indicate that Hardesty Mountain roadless area could provide 2,562 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. Potential trails have been identified and could provide access and disperse visitors in the area. No potential developed recreation sites have been identified.

Cultural Resources Limited cultural resource surveys have been carried out as of 1985. Evidence of aboriginal travel routes and seasonally occupied camps indicate the area contains a relatively moderate percentage of high probability area where the potential for discovery of prehistoric sites remains high.

Management Considerations

Fire There have been no known large fires in recorded history. All recent fires have been caused by lightning and have been confined to single trees. There is evidence of large areas being burned hundreds of years ago. Fuel loading ranges from 15 tons per acre in the second growth stands to 180 tons per acre in the old-growth stands.

Insects and Disease This area has been infested with Douglas-fir bark beetle and gypsy moth. It was sprayed with biological control agents, BT for gypsy moths in 1985 and 1986 and MCH to interfere with the spread of the Douglas-fir bark beetle, in 1985. There are also pockets of root rot, *Phellinus weirii*, scattered throughout the area.

Need

Nearby Wilderness and Its Use More diverse primitive recreation use is provided by the Waldo Lake Wilderness (37,157 acres), Diamond Peak Wilderness (19,773 acres), and the Three Sisters Wilderness (189,346 acres). All are within 60 highway miles from the Eugene-Springfield area. Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 26 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Haredesty Mountain roadless area generated a moderate amount of interest with 60% of the responses favoring inclusion of the roadless area into the inventory. Hardesty Mountain has a lengthy history of public involvement. Since its inclusion in RARE II, the public has expressed a number of concerns. It received congressional attention when it was released for multiple-use management in the Oregon Wilderness Act of 1984. In October, 1984, the Willamette National Forest facilitated the formation of a consensus group. The group developed a proposal for future management

of the area by considering all resources and issues involved. The proposal was to be addressed in at least one alternative in this Plan.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Hardesty Mountain roadless area. In Alternatives NC, K, A, J, and W, 50 to 99% of this area will be affected by road construction and timber harvest. Alternative D will develop 31% of the area. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternative L, would alter the suitability of this area for future Wilderness consideration. Alternative L maintains the option of future Wilderness consideration for most of the area, while Alternatives NC, K, A, J, and W maintain this option on a portion of the area, depending on the allocation of adjoining roadless lands in the Umpqua National Forest FEIS. Figure C-33-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Hardesty Mountain roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, K, A, J, and W. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L and D. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-33-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-33-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	3,626
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	981	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	21	--	21	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	981	981	192	192	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	1,664	661	2,432	43
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	107	--	704	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	235	--
Management Area **11d**	--	--	--	85	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	--	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	3,669	2,453	2,538	917	1,728	917	21
15 Riparian [2]							
Management Area **15**	*	149	149	128	128	107	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-32-3. Hardesty Mt. Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

		Alternatives						
Output, Effects, or Activity	**Unit of Measure**	**NC**	**K**	**A**	**J**	**W**	**D**	**L**
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	3,626
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	263	263	356	--
	Acres	--	--	--	1,664	1,642	2,432	43
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	--	1,753	1,753	914	420	1,235	--
	Acres	21	1,130	1,152	405	320	341	--
Roaded Modified	RVDs	2,467	1,766	1,766	1,044	1,234	570	95
	Acres	3,669	2,560	2,538	1,621	1,728	917	21
Trails								
Existing Trails								
Full Protection Level	Miles	2.0	4.0	5.0	7.0	5.0	8.0	9.0
Moderate Protection Level	Miles	--	--	--	1.0	4.0	--	--
Low Protection Level	Miles	6.0	4.0	4.0	2.0	--	1.0	--
Potential Trails								
Full Protection Level	Miles	0.0	0.0	0.0	1.0	1.0	1.0	2.0
Moderate Protection Level	Miles	--	1.0	1.0	1.0	1.0	1.0	--
Low Protection Level	Miles	2.0	1.0	1.0	--	--	1.0	--
Visual Quality Objectives								
Preservation	Acres	21	981	1,003	1,856	1,834	2,432	3,669
Retention	Acres	--	--	--	--	--	--	--
Partial Retention	Acres	--	149	149	213	128	341	--
Modification	Acres	--	107	--	704	--	--	--
Maximum Modification	Acres	3,669	2,453	2,538	917	1,728	917	21
1st Decade								
Road Construction	Miles	--	2.0	3.0	2.0	1.3	1.3	0.1
Area Harvested	Acres	--	398	478	502	326	239	61
Programmed Timber Harvest	MBF	--	2,848	4,105	4,490	2,899	2,867	546
Area Remaining Undeveloped	%	--	67	60	58	73	80	95
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	3,136	2,261	2,240	1,002	896	1,088	21
75-94% of Full Yield	Acres	--	43	43	128	149	--	--
50-74% of Full Yield	Acres	--	85	85	85	--	43	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Bulldog Rock - 555 Acres

Description

History The Bulldog Rock roadless area was evaluated in RARE II. The area was considered for Wilderness by the United States Congress. They released the area for multiple-use management in the Oregon Wilderness Act of 1984. This 555 acre area is a portion of the 6,997 acre Bulldog Rock roadless area that includes 6,442 acres on the Umpqua National Forest.

Location and Access The Bulldog Rock roadless area is located in T.25S., R.3E. of Douglas County, approximately 21 miles south of Oakridge on the Rigdon Ranger District. The area is bordered on the east boundary and north boundary by Forest Road 5850. Forest Road 5850 accesses the eastern perimeter.

Geography and Topography The Bulldog Rock area contains a combination of meadows, rocky points, and timbered slopes at elevations of 4,800 feet to 5,800 feet. It is at the crest of the Calapooya Divide and has a variety of topographic features, ranging from gentle and rolling to very steep and precipitous.

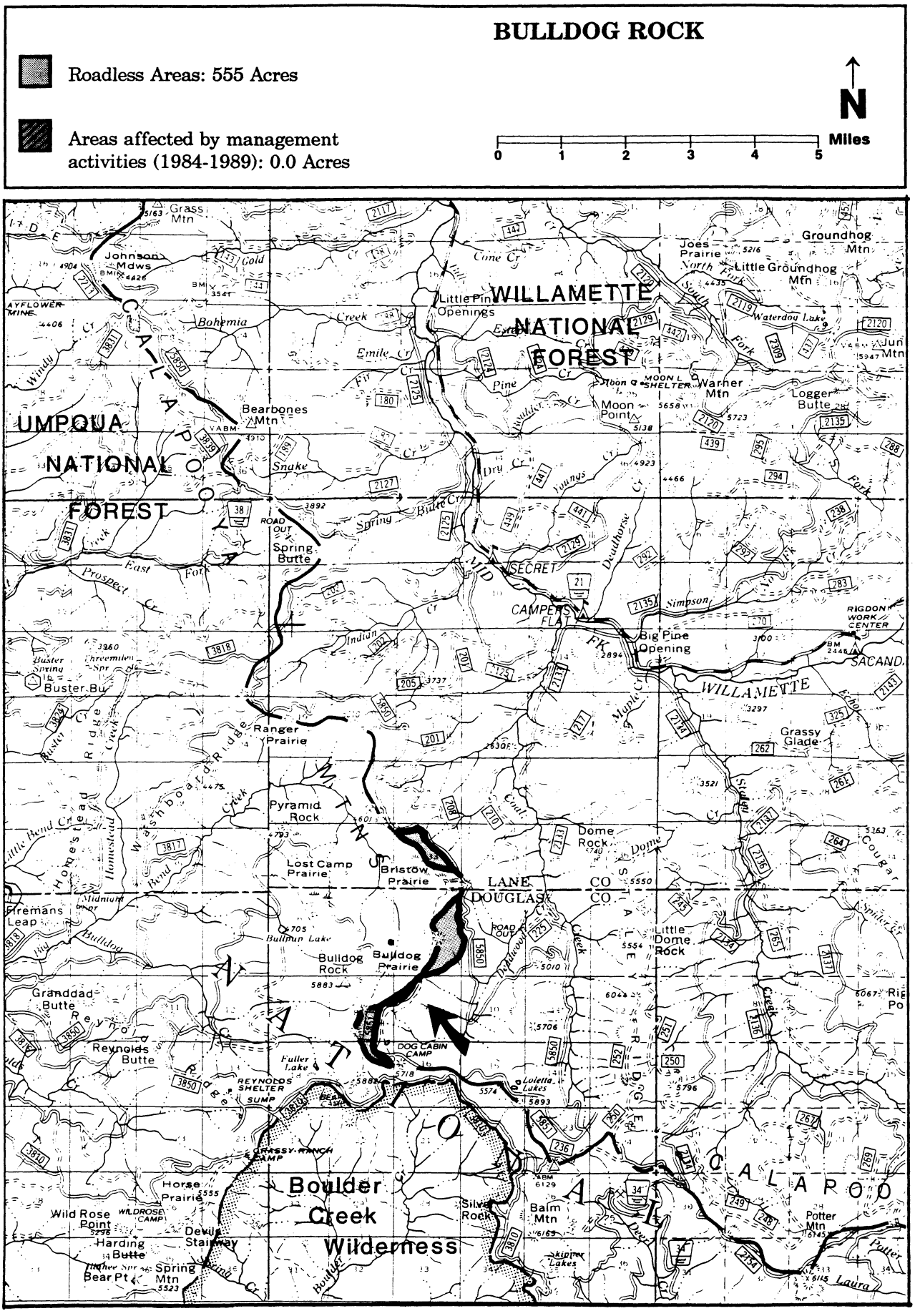
Soil Generally soils have low fertility, low moisture content, and are shallow and coarse textured with a short growing season. There are about 235 acres that have potential for severe surface erosion; and approximately 64 acres of potentially severe surface erosion and unstable soil. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation The timber cover consists of about 30% Douglas-fir and 70% true fir (Shasta red, noble, and Pacific silver).

Ecosystem There is one major potential vegetation zone and two vegetation communities for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative communities are fir/hemlock (*Abies-Tsuga*) forest (004) and Pacific silver fir/Douglas-fir (*Abies-Pseudotsuga*) forest (003).

Current Uses There is very little use other than big-game hunting and a range allotment. The Recreation Opportunity Spectrum (ROS) class is Semiprimitive Nonmotorized. The area is part of the Bulldog Rock Roadless Area as allocated in the Umpqua Land Management Plan of 1978.

Figure C-34-1


BULLDOG ROCK
Roadless Areas: 555 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
0 1 2 3 4 5 Miles
WILLAMETTE NATIONAL FOREST
UMPQUA NATIONAL FOREST
CALAPOOIA
Boulder Creek Wilderness
Bulldog Rock
Bulldog Prairie
Lost Camp Prairie
Bristow Prairie
Pyramid Rock
Ranger Prairie
Spring Butte
Bearbones Mtn
Johnson Mdws
Grass Mtn
Little Pine Openings
Joes Prairie
Groundhog Mtn
Little Groundhog Mtn
Warner Mtn
Logger Butte
Moon Point
Big Pine Opening
Grassy Glade
Dome Rock
Little Dome Rock
Reynolds Butte
Granddad Butte
Wild Rose Point
Harding Butte
Spring Mtn
Horse Prairie
Devils Stairway
Silver Rock
Balm Mtn
Potter Mtn
Laura
Fuller Lake
Luetta Lakes
Kipter Lakes
Waterdou Lake
Buster Spring
Firemans Leap
Bohemia
Prospect
Secret
Campers Flat
Rigdon Work Center
Dog Cabin Camp
Reynolds Shelter
Grassy Ranch Camp
Wildrose Camp
LANE CO
DOUGLAS CO

Appearance A number of meadows are scattered throughout the area. The forested areas have a great variety of undergrowth ranging from dense vinemaple on the east slopes to huckleberry and queenscup bead lily on cold north slopes and the flatter areas near Forest Road 5851. The prominent old-growth noble fir dwarf the wildflowers that bloom vibrantly in the parklike stands of the flats. The Pacific silver fir and Alaskan yellow cedar are indicative of the harsh cold on the north slopes.

Surroundings The area to the north and east are allocated to timber management with a number of existing clearcuts. To the west is the Umpqua National Forest's portion of the Bulldog Rock roadless area and to the south is the Boulder Creek Wilderness established in 1984, both of which are on the Umpqua National Forest.

Attractions The meadows and surrounding old-growth are host to a great variety of wildflowers and wildlife.

Capability

Manageability and Boundaries The boundaries could be located on nonconforming use developments which serve as good barriers against future intrusions. No conflict is foreseen with current or future nonconforming structures or activities. Boundaries could be easily defined on the ground. Manageability would be somewhat difficult because of the easy access for off-road vehicles onto Bristow Prairie.

Natural Integrity Activities and facilities that are present include a 1/8 mile trail in Section 8, grazing distributed throughout the whole area, a salvage harvest of timber dispersed over a small area, a small weir to trap spring water, a broken down fence to protect the weir, a metal watering trough, intermittent air pollution effects over the entire area, and water pollution from grazing animal waste in a small Class III stream.

Trail, grazing, illegal off-road vehicles, and water pollution impacts are present and measurable but of only minor consequence. Processes continue to operate largely uninterrupted.

Natural Appearance The nearby clearcut would be perceptible to few visitors, because of the easy separability by ridges and Forest canopy. Air pollution is perceived on an intermittent basis. Visible trail, weir, fence, trough, ruts of a primitive road, and timber salvage evidence is minor.

Opportunity for Solitude Opportunities for solitude in the 555 acre area are low. Rolling-type terrain, limited diversity of topography offers limited screening potential. Vegetative screening is good in a least half the area, screening people easily within a quarter mile of one another. However, limited or no screening is available in Bristow Prairie. The distance from the perimeter of the roadless area to the approximate geographic center is more than one mile. Offsite intrusions are perceptible, but most are relatively distant.

Opportunity for Primitive Recreation Opportunities for primitive recreation are low with little variety.

Special Features A candidate plant of Federal concern has been sighted and documented in Bristow Prairie. It is a candidate for the Federal list of endangered or threatened plants. However, the taxa has proven to be more abundant or widespread than was previously believed. There are no federally listed endangered or threatened species known to be present.

Cultural features include several prehistoric and historic sites in and around the area.

Availability

Resource Potentials

Recreation and Range Resources Trail pack animals could be used on Bristow Prairie and on the more gentle areas. Capacity estimates indicate that this area could provide 332 Recreation Vehicle Days (RVDs) of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified.

Timber Resources The roadless area includes about 342 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 14 million board feet. If stands are converted to a managed condition, biological potential yield will be 38,600 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining 213 acres are unsuitable or unavailable.

Cultural Resources There is a high probability for sites as evidenced by existing recorded sites along the Calapooya Divide.

Wildlife Resource The Bulldog Rock roadless area is highly favored as summer range by elk from both the Umpqua and Willamette National Forest. Up to 100 elk use this area. On an observation flight, officials from the Oregon Department of Fish and Wildlife estimated 500 elk within a 10 mile strip along the Calapooya Divide in the vicinity of this roadless area.

Creating early successional stages would benefit big-game habitat by providing additional summer forage. Regulation of timber harvest and road traffic would ensure adequate cover and retention of quality habitat.

Range Resource The allotment will continue for grazing cattle.

Management Consideration Since human intervention with suppression, fire occurrence has been very low. Fuel loads range from 14 to 50 tons per acre.

Need

Nearby Wilderness and Its Use The Bulldog Rock roadless area is immediately north of Boulder Creek Wilderness (19,100 acres). Use is considered light compared to its carrying capacity. As of 1984 use was 3,145 RVDs with a carrying capacity of 23,055 RVDs per year. Also, within the vicinity are seven other roadless areas on the Umpqua National Forest. People concentrate their recreation on the trails and around the few lakes in the vicinity.

Distance from Population Centers The area is approximately 70 miles by road to the southeast of Eugene and 60 miles northeast of Roseburg.

Interest by Proponents The Bulldog Rock roadless area generated a low amount of interest with 60% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Bulldog Rock roadless area. In Alternatives NC, A, and K, 50 to 73% of this area will be affected by road construction and timber harvest. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with Alternatives NC, A, and K, would alter the suitability of this area for future Wilderness consideration. Alternatives J, D, L, and W maintain the option of future Wilderness consideration for this area, depending on the allocations of adjoining roadless lands in the Umpqua National Forest FEIS, Figure C-34-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Bulldog Rock roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternative K, NC, and A. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L, D, W, and J. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-34-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-34-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	--
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	85	384	171
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	150	--	--	21	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	277	--	277	555	448	171	384
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	--	--	--	--	--	--
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	277	405	277	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-34-3. Bulldog Rock Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	--
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	191	--	191	393	371	152	238
	Acres	277	--	277	555	448	171	384
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	--	469	--	--	198	2,347	1,457
	Acres	--	149	--	--	107	384	171
Roaded Modified	RVDs	817	1,329	817	--	--	--	--
	Acres	277	405	277	--	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	--	3.0	--	--	--	--	--
Moderate Protection Level	Miles	--	4.0	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	2.0	2.0	2.0	2.0	--	2.0	2.0
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	1.0	--	1.0	--	2.0	--	--
Visual Quality Objectives								
Preservation	Acres	277	--	277	555	533	555	555
Retention	Acres	--	149	--	--	21	--	--
Partial Retention	Acres	--	--	--	--	--	--	--
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	277	405	277	--	--	--	--
1st Decade								
Road Construction	Miles	--	0.2	0.0	--	--	--	--
Area Harvested	Acres	--	9	9	--	--	--	--
Programmed Timber Harvest	MBF	--	39	84	--	--	--	--
Area Remaining Undeveloped	%	--	94	95	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	171	277	171	--	--	--	--
75-94% of Full Yield	Acres	--	--	--	--	--	--	--
50-74% of Full Yield	Acres	--	--	--	--	--	--	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

Diamond Peak North - 1,130 Acres

Description

History There were about 4,778 acres in the Diamond Peak North roadless inventory which is contiguous to the Diamond Peak Wilderness. The Oregon Wilderness Act of 1984 designated 3,520 acres to be added to Diamond Peak Wilderness and releasing 1,258 acres for multiple-use management. Since the release of these lands in 1984, approximately 128 acres have been affected by development activities.

Location and Access Diamond Peak North lies contiguous to the Diamond Peak Wilderness in two areas approximately 16 miles southeast of Oakridge. One is on the north end near Lopez and Vivian Lakes on the Oakridge Ranger District in T.23S., Rs.5 and 5½E. The second is on the west side near Pioneer Gulch and Emigrant Creek on the Rigdon Ranger District in T.24S., R.5E.

Forest Roads 5884409 and 5899411 access the north end. Another route is by Forest Road 2316510 near Pinto Mountain. The west side is accessed by Forest Road 2160 and 2160406. Forest Trail 3662 to Notch Lake and Fall Creek Falls access the north and Trail 3630 accesses a small portion of the westside.

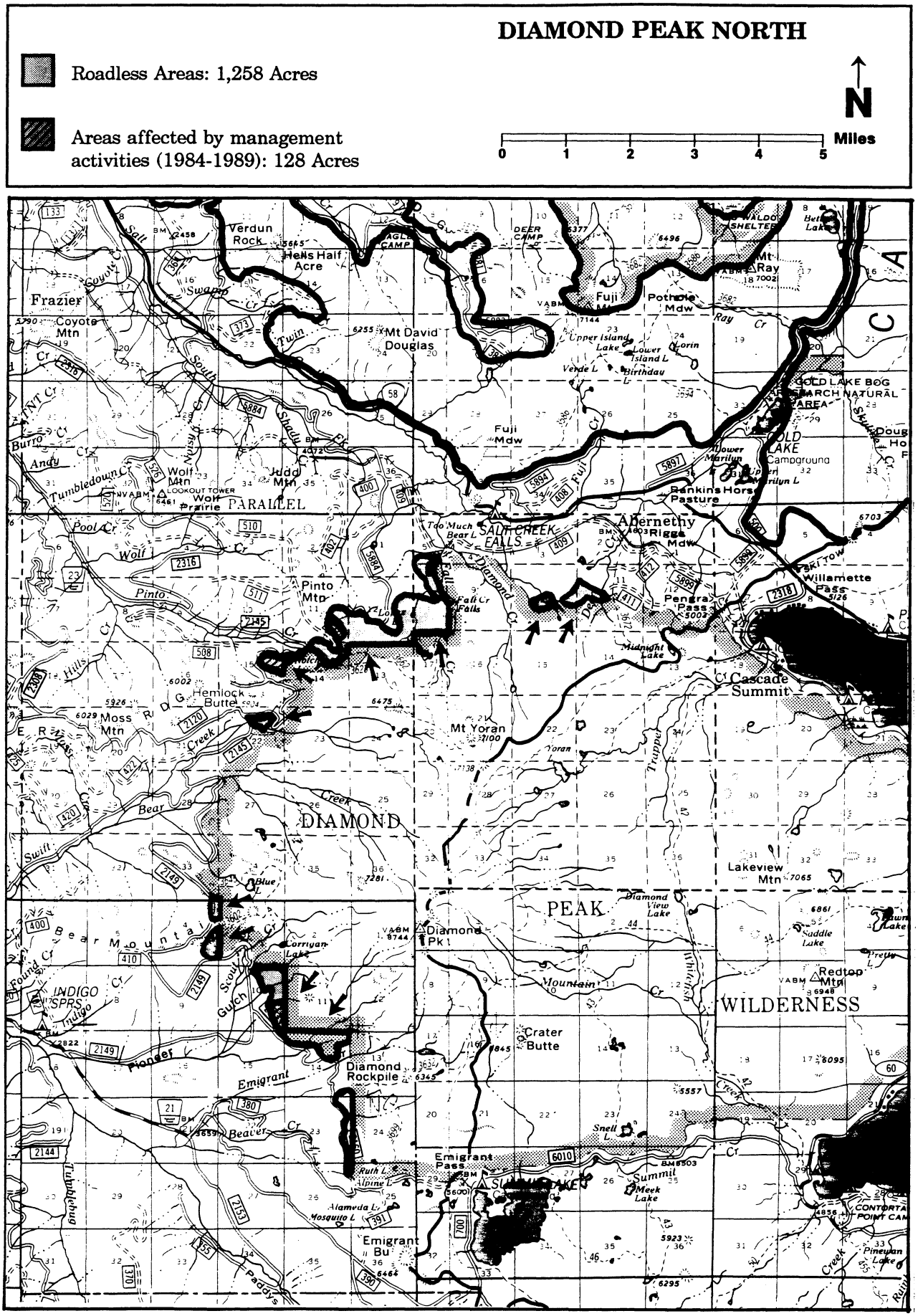
Geography and Topography The area is typical of the High Cascades where volcanization originally formed the lands of Diamond Peak and its surrounding territory. These lower slopes of Diamond Peak vary in their landform in that, very steep concave slopes give way to more gently rolling convex landforms. Springs tend to come to surface below the steep slopes and cause swamps and meadows to form on the flats. The west side is primarily convex and rolling.

Elevations range from a high of 6,240 feet near Pinto Mountain to 4,320 feet at the lowest point near the mouth of Fall Creek in the north. The terrain is highly varied from rolling ridges and flats around Lopez Lake to very steep west southwest of Lopez Lake. The western side is moderately steep and dissected.

Soil Soils are generally composed of coarse pumice and ash with low fertility and moisture. Subsoil ranges from sandy to stony loam. Soil is cold and has a short growing season. Depths range from six inches to six feet. Rock outcrops may occur along benches and on very steep slopes. There are about 256 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation True firs dominate 90% of the stands. Douglas-fir increases on warmer southerly aspects. Mountain hemlock and lodgepole pine increase on colder northerly aspects.

Figure C-35-1


DIAMOND PEAK NORTH
Roadless Areas: 1,258 Acres
Areas affected by management activities (1984-1989): 128 Acres
N
0 1 2 3 4 5 Miles
Verdun Rock
Hens Half Acre
Frazier
Coyote Mtn
Mt David Douglas
Fuji Mtn
Potholes Mdw
Mt Ray
Ray Cr
Upper Island Lake
Lower Island L
Birthday L
Verde L
Fuji Mdw
Wolf Mtn
Judd Mtn
Wolf Prairie
PARALLEL
Tumbledown Cr
Burro Cr
Andy Cr
Pool Cr
Wolf Cr
Pinto Mtn
Pinto Cr
Too Much Bear L
SALT CREEK FALLS
Diamond Cr
Fall Cr Falls
Abernethy Rigg
Rankins Horse Pasture
Lower Marilyn
Upper Marilyn L
Pengra Pass
Willamette Pass
Midnight Lake
Cascade Summit
Hemlock Butte
Moss Mtn
Mt Yoran
Yoran
Trapper Cr
DIAMOND PEAK
WILDERNESS
Diamond Pk
Diamond View Lake
Lakeview Mtn
Saddle Lake
Redtop Mtn
Mountain Cr
Crater Butte
Diamond Rockpile
Corriyan Lake
Scout Lake
Gulch
Bear Mountain
Indigo Cr
Indigo SPRS
Pioneer
Emigrant
Emigrant Bu
Emigrant Pass
Summit Meek Lake
Snell L
Ruth L
Alpine L
Alameda L
Mosquito L
Paddys
Beaver Cr
Blue L
Swift Cr
Found Cr
Hills Cr
Creek
Pinnacle Ridge
Tumbledown
CONTORTA POINT CAMP
Pinetop Lake
Gold Lake Bog Research Natural Area
Gold Lake Campground
Doug Ho
Skyline
Ski Tow

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock (*Abies-Tsuga*) forest (004).

Current Uses The area west of Lopez Lake is allocated to Scenic Influence I in the 1977 Forest Land Management Plan. The area east and north is allocated to Scenic Influence II. These allocations are for areas seen from State Highway 58. Lopez Lake has a natural population of brook trout that attracts a very small amount of fishing. The Vivian Lake trail attracts a greater number of hikers from the Salt Creek Falls side of the area. Visitor days have not been monitored except from the Notch Lake side where Recreation Visitor Days (RVDs) were 191 for the 1984 season. Oakridge District personnel estimated the RVDs to be over 200 for the trail from Salt Creek Falls. Pioneer Gulch Trail 3630 which goes through the west side has a Scenic Influence II allocation. The trail head which is the only destination point in this area is located on Forest Road 2160. The trail is an access point to other wilderness trails and receives limited use. RVDs were about 35 for the 1984 season. Roads have been built for timber harvest. Since this area wa inventoried in 1984 management activities are estimated to have affected 43 acres of the area.

Appearance The west side is a continuous forest canopy with a light shrub cover. The forest tends to be plain without a break in texture. The north end has alder, willow, and vine maple growing in the meadows of the steep terrain. The meadows probably originated from snow avalanches and weathering of basalt outcroppings. The flat meadows below these steeper openings contain shrubs, forbs, and grasses. Conifers are pioneering their way into the meadows. The older established clumps of conifers break up the meadow and create a maze-like effect. The clearcut near Lopez Lake is not easily seen from the lake. The forest canopy beyond the meadows is thick and continuous with rhododendron being the major shrub.

Surroundings To the immediate north is a full yield potential forest which includes timber harvest units. Farther to the north is State Highway 58 and the Scenic Influence I corridor that faces the northern part. The west side is bordered by land allocated to full timber yield, which includes harvest units that border some of the area.

Attractions Vivian Lake Trail and Lopez Lake are the greatest attractions. Day hikes are common with fishing and hunting being the main interest.

Capability

Manageability and Boundaries The boundaries abut areas of nonconforming uses outside the boundary. These nonconforming activities make boundary location easier to establish on the ground. Roads have been developed into these nonconforming areas which provide access to possible future trail head development.

Natural Integrity The Diamond Peak North roadless area has 0.5 mile of trail located in the west portion, recreation around Lopez Lake, a small clearcut in the north portion, fire history dispersed over 60 to 70% of the area, and intermittent air pollution over the entire area. Sounds of the State Highway 58 and railroad corridor cannot be buffered and will intrude into the northern area.

Natural Appearance The clearcut is well hidden by the thick canopy of the forest and the long crowns of the islands of trees in the meadows. The clearcut is not seen by the user on the trail to Vivian Lake and is expected by those who go to Lopez Lake by way of Forest Road 5884405. Air pollution may be seen at times but is intermittent.

Opportunity for Solitude The sound of traffic from State Highway 58 on a quiet windless day breaks some of the solitude. The dense crown of the overstory to the brush in the understory creates a backdrop which screen people from each other.

Opportunity for Primitive Recreaion There is opportunity for fishing, hiking, hunting, orienteering, and camping.

Special Features Near the turn of the century sheepherders brought their flocks to graze and water at Lopez Lake. Blazes on trees around the lake are still evidence of their early entry to this high country. Other features are common. No federally listed threatened or endangered species are known to be present.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 720 Recreation Visitor Days (RVDs) of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified.

Timber Resource The roadless area includes about 768 acres of land suitable for growing timber under managed conditions. Stands of mature Douglas-fir, true firs, and mountain hemlock occupy the area representing about 23 million board feet. If stands are converted to a managed condition, biological potential yield will be 70,000 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V. The remaining area is unsuitable.

Cultural Resources There have been no sites identified in the area as of 1985. However, there are several nearby which indicate a high probability of sites in the area.

Wildlife Resource The area can be maintained as a travelway and cover for elk that travel between the Wilderness and Loggers Butte. The area is surrounded by plantations with trees that vary from one inch to four inches in diameter. In 10 to 15 years these plantations will supply more cover.

Management Considerations Since human intervention with suppression, fire occurrence is very low. Fuel loads range from 14 to 30 tons per acre.

Need

Nearby Wilderness and Its Use The Diamond Peak North roadless area is adjacent to the Diamond Peak Wilderness (53,773 acres), and 5 miles south of the Waldo Lake Wilderness (37,157 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance from Population Centers The area is approximately 60 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Diamond Peak North roadless area generated a high amount of interest with 86% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Diamond Peak North roadless area. In Alternatives NC, K, A, J, 62 to 100% of this area will be affected by road construction and timber harvest. Alternative W develops 34%, Alternative D develops 19%, Alternative L develops 4%. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with all Alternatives, except Alternative L, would alter the suitability of some of this area for future Wilderness consideration. However, portions of this area contiguous to the Diamond Peak Wilderness would remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternatives L and D maintain the option of future Wilderness consideration for most of this area. Figure C-35-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Diamond Peak North roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, K, and J. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives W, D, and L. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-35-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-35-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	1,003
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	171	171	--	--	--	21
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	21	--	--	128	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	107	--	--
Management Area **10b**	--	--	--	--	--	--	21
Management Area **10c**	--	--	--	--	--	--	21
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	427	427	875	--
Management Area **10f**	--	--	--	--	43	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	427	--	405	171	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	235	107	--	128	107	107	--
Management Area **11d**	43	--	213	21	--	21	--
Management Area **11e**	213	--	21	--	--	--	--
Management Area **11f**	--	--	213	--	--	--	21
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	21	21	21	21	21	21	21
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	619	320	427	64	85	64	--
15 Riparian [2]							
Management Area **15**	*	64	64	64	43	42	21

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-35-3. Diamond Peak North Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	1,003
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	327	313	558	--
	Acres	--	--	--	427	427	875	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	26
	Acres	--	--	--	--	--	--	43
Roaded Natural	RVDs	3,385	3,705	5360	2,322	2,989	1,976	494
	Acres	491	363	683	213	427	171	64
Roaded Modified	RVDs	1,728	1,614	968	892	664	152	95
	Acres	640	768	448	491	277	85	21
Trails								
Existing Trails								
Full Protection Level	Miles	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Moderate Protection Level	Miles	0.0	0.0	--	--	--	--	--
Low Protection Level	Miles	1.0	--	0.0	0.0	--	0.0	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	171	171	427	427	875	1,024
Retention	Acres	213	21	213	--	171	--	43
Partial Retention	Acres	277	171	299	213	256	171	43
Modification	Acres	21	448	21	427	192	21	21
Maximum Modification	Acres	619	320	427	64	85	64	--
1st Decade								
Road Construction	Miles	--	0.5	0.8	1.0	0.5	0.5	0.1
Area Harvested	Acres	--	73	124	76	69	47	3
Programmed Timber Harvest	MBF	--	533	918	559	562	834	17
Area Remaining Undeveloped	%	--	80	66	78	81	87	99
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	726	534	512	320	256	128	--
75-94% of Full Yield	Acres	43	43	21	43	--	21	--
50-74% of Full Yield	Acres	--	21	64	21	--	21	--
30-49% of Full Yield	Acres	--	--	--	--	--	--	21

Diamond Peak South - 149 Acres

Description

History There were about 597 acres in the Diamond Peak South roadless inventory contiguous to the Diamond Peak Wilderness. The Oregon Wilderness Act of 1984 designated 448 acres of the 597 acres as Wilderness, releasing 149 acres for multiple- use management.

Location and Access Diamond Peak South lies contiguous to the southwest portion of Diamond Peak Wilderness approximately 24 miles southeast of Oakridge. Geographically it is a half mile east of Beaver Marsh and south of Emigrant Creek on the Rigdon Ranger District in T.24S., R.5E. The area is entirely bordered on the west by Forest Road 2160.

Geography and Topography The area is typical of the High Cascades where volcanism originally formed the lands of Diamond Peak and its surrounding territory. The lower southwest slopes vary in their landform in that moderately steep convex slopes give way to more gently rolling convex terrain to flat landforms.

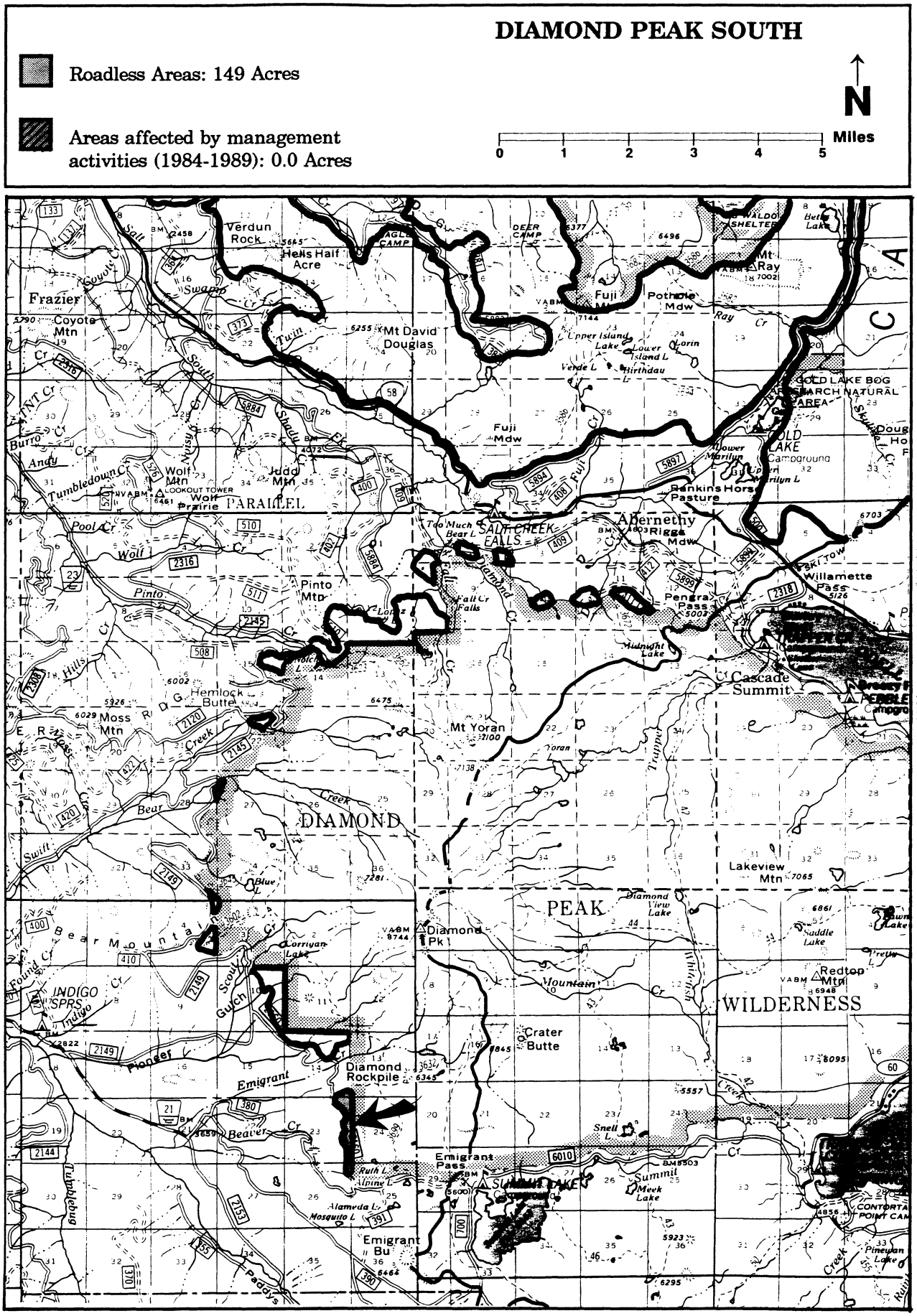
Elevations range from 5,480 feet near the northeast corner to 5,000 feet near a rock pit in the southern portion. The terrain moderates from steep rolling ridges in the north to rolling ridges with several rock outcrops in the south.

Soil Soils are generally composed of coarse pumice and ash with low fertility and moisture. Subsoil ranges from sandy loam to stony loam. Soil is cold and has a short growing season. There are about 43 acres that have potential for severe surface erosion. For more soil information refer to *Willamette National Forest Soil Resource Inventory* (Legard and Meyer 1973).

Vegetation True fir and mountain hemlock dominate 90% of the stands but may vary to Douglas-fir on warmer aspects. Mountain hemlock, white pine, true firs, and lodgepole pine occur on colder aspects (10%).

Ecosystem There is one major potential vegetation zone and one vegetation community for this area according to classification systems by Bailey (1976) and Kuchler (1966). The vegetation zone is the Pacific Forest (M2410) zone. The vegetative community is fir/hemlock (*Abies-Tsuga*) forest (004).

Figure C-36-1


DIAMOND PEAK SOUTH
Roadless Areas: 149 Acres
Areas affected by management activities (1984-1989): 0.0 Acres
N
0 1 2 3 4 5 Miles
Verdun Rock
Hells Half Acre
Frazier
Coyote Mtn
Mt David Douglas
Fuji Mdw
Pothole Mdw
Mt Ray
Upper Island Lake
Lower Island L
Verde L
Birthday L
GOLD LAKE BOG RESEARCH NATURAL AREA
GOLD LAKE Campground
Lower Marilyn
Upper Marilyn L
Rankins Horse Pasture
Wolf Mtn LOOKOUT TOWER
Wolf Prairie
PARALLEL
Judd Mtn
Abernethy Ridge
Too Much Bear L
SALT CREEK FALLS
Willamette Pass 5126
Pinto Mtn
Fall Cr Falls
Midnight Lake
Cascade Summit
Hemlock Butte
Moss Mtn
Mt Yoran 7100
DIAMOND PEAK
Lakeview Mtn 7065
Diamond View Lake
Diamond Pk
Saddle Lake
Redtop Mtn
WILDERNESS
Crater Butte
Diamond Rockpile
Emigrant Pass
SUMMIT LAKE
Summit
Meek Lake
Snell L
Ruth L
Alpine L
Alameda L
Mosquito L
Emigrant Bu
Lorriman Lake
INDIGO SPRS
Pineyan Lake
CONTORTA POINT CAMP

Current Uses The area is allocated to full yield timber management in the 1977 Forest Land Management Plan with a Semiprimitive Nonmotorized Recreation Opportunity Spectrum (ROS) class. Signs of past salvaging of timber still remain. The trail head for the Rockpile Lake Trail (3230) is a few hundred feet north of the area. This trail had 235 Recreation Visitor Days (RVDs) use during the 1984 season.

Appearance The area is broken up by partially obscured skid roads, stumps, and a rock pit.

Surroundings Full yield timber management areas borders the nonwilderness sides.

Attractions There are no significant attractions.

Capability

Manageability and Boundaries The boundaries form along nonconforming uses outside the boundary. These nonconforming activities make boundary location easier to establish on the ground. Road 2160 is the developed nonconforming boundary on the west side.

Natural Integrity Timber salvage activity, skid roads, a rock pit, and intermittent air pollution are present.

Natural Appearance The disturbance of apparent naturalness is high from the skid roads, timber salvage, and the rock pit.

Opportunity for Solitude The sounds of traffic on Forest Road 2160 may be easily seen and heard. The nearness of the road takes away from any heightened awareness or spirit of adventure.

Special Features The area contains only common features. No cultural features or federally listed endangered or threatened species are known to be present.

Availability

Resource Potentials

Recreation Resource Capacity estimates indicate that this area could provide 110 RVDs of Semiprimitive recreation use. No potential trail locations or developed recreation sites have been identified.

Timber Resource The roadless area includes about 149 acres of land suitable for growing timber under managed conditions. Stands of mature white pine, true firs, and mountain hemlock occupy the area representing about 5 million board feet. If stands are converted to a managed condition, biological potential yield will be 14,400 cubic feet per year at culmination of mean annual increment. Site productivity ranges from Class IV to Class V.

Cultural Resources There have been no sites identified in the area as of 1985. However, there are several nearby which indicate a high probability of sites in the area.

Wildlife Resource Because this area is used as a travelway for elk, timber harvesting should provide for forage while ensuring linkage of adequate hiding cover.

Management Considerations

Fire Since human intervention with suppression, fire occurrence is very low. Fuel loads range from 14 to 30 tons per acre. Fuel loads may be slightly higher in stands associated with white pine.

Insects and Disease White pine blister rust is common on western white pine. Much of the salvaging that took place in the area harvested the severely infected white pine.

Need

Nearby Wilderness and Its Use The Diamond Peak South roadless area is adjacent to the Diamond Peak Wilderness (53,773 acres), and 4 miles north of the Oregon Cascades Recreation Area (6,122 acres). Refer to Chapter III for the amount of use these Wildernesses receive.

Distance to Population Centers The area is approximately 75 miles by road to the southeast of Eugene, Oregon.

Interest by Proponents The Diamond Peak south roadless area generated a high amount of interest with 83% of the responses favoring inclusion of the roadless area into the inventory.

Environmental Consequences

As a consequence of implementing any of the proposed Alternatives there will be effects on the Diamond Peak South roadless area. In Alternatives NC, A, and K, 100% of this area will be affected by road construction and timber harvest. Alternative L will develop 29% of the area. As a result of this development, uses dependent on roadless conditions, such as semiprimitive recreation, will not be provided in portions of the area. Implementation of proposed management activities associated with Alternatives NC, A, K, and L, will alter the suitability of this area for future Wilderness consideration. However, portions of this area contiguous to the Diamond Peak Wilderness in Alternative L will remain suitable for consideration as Wilderness additions in the next cycle of Forest planning. Alternatives J, D, and L maintain the option of future Wilderness consideration for this area. Figure C-36-2 illustrates how this area has been allocated in each Alternative.

Based on the amount and distribution of management areas assigned to the Diamond Peak South roadless area, an array of goods and services are provided. Emphasis on priced commodities such as wood products are provided in Alternatives NC, A, and K. Emphasis on amenity values such as dispersed recreation opportunities, high visual quality, and old-growth habitat are provided in Alternatives L, D, W, and J. The amounts of other goods and services to be provided from the area for each Alternative are illustrated in Figure C-36-3. Additional information regarding the environmental consequences of the activities associated with these goods and services is located in Chapter IV of this FEIS.

Table T314. Management Area Acreage of Alternatives (C-36-2)

Management Areas	Alternatives						
	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
1 Wilderness							
Management Area **1a**	--	--	--	--	--	--	--
Management Area **1b**	--	--	--	--	--	--	107
Management Area **1c**	--	--	--	--	--	--	--
Management Area **1d**	--	--	--	--	--	--	--
2 Oregon Cascades Recreation Area							
Management Area **2a**	--	--	--	--	--	--	--
Management Area **2b**	--	--	--	--	--	--	--
3 Experimental Forest							
Management Area **3**	--	--	--	--	--	--	--
4 Research Natural Area							
Management Area **4**	--	--	--	--	--	--	--
5 Special Interest Area							
Management Area **5a**	--	--	--	--	--	--	--
Management Area **5b**	--	--	--	--	--	--	--
6 Wild and Scenic River							
Management Area **6a**	--	--	--	--	--	--	--
Management Area **6b**	--	--	--	--	--	--	--
Management Area **6c**	--	--	--	--	--	--	--
7 Old-Growth Grove							
Management Area **7**	--	--	--	--	--	--	--
8 T & E Species							
Management Area **8**	--	--	--	--	--	--	--
9 Special Habitat [1]							
Management Area **9a**	--	--	--	--	--	--	--
Management Area **9b**	--	--	--	--	--	--	--
Management Area **9c**	--	--	--	--	--	--	--
Management Area **9d**	--	--	--	--	--	--	--
10 Dispersed Recreation							
Management Area **10a**	--	--	--	--	--	--	--
Management Area **10b**	--	--	--	--	--	--	--
Management Area **10c**	--	--	--	--	--	--	--
Management Area **10d**	--	--	--	--	--	--	--
Management Area **10e**	--	--	--	149	149	149	--
Management Area **10f**	--	--	--	--	--	--	--

Management Areas	NC (No Change)	K (WFC)	A (No Action)	J (DEIS-PA)	W (PA)	D (Wildlife)	L (ONRC)
11 Scenic							
Management Area **11a**	--	--	--	--	--	--	--
Management Area **11b**	--	--	--	--	--	--	--
Management Area **11c**	--	--	--	--	--	--	--
Management Area **11d**	--	--	--	--	--	--	--
Management Area **11e**	--	--	--	--	--	--	--
Management Area **11f**	--	--	--	--	--	--	43
12 Developed Recreation							
Management Area **12a**	--	--	--	--	--	--	--
Management Area **12b**	--	--	--	--	--	--	--
13 Special and Administrative Use							
Management Area **13a**	--	--	--	--	--	--	--
Management Area **13b**	--	--	--	--	--	--	--
14 General Forest							
Management Area **14a**	149	149	149	--	--	--	--
15 Riparian [2]							
Management Area **15**	*	*--	*--	*--	--	--	--

[1] Acres of network sites that overlap with other no harvest management areas are not included in MA9a, 9b, 9c acres.
[2] Only alternatives with acres assigned to no harvest prescriptions for riparian have acres allocated to MA15. In alternatives K, A, and J riparian acres follow Forest-wide standards and guidelines for riparian harvest rates. Riparian acres in NC are distributed throughout other management areas.

Table C-36-3. Diamond Peak South Roadless Area
Quantifiable Resources Outputs, Environmental Effects, and Activities by Alternative

Output, Effects, or Activity	Unit of Measure	Alternatives						
		NC	K	A	J	W	D	L
Recommended Wilderness								
Recreation Use 1st Decade	RVDs	--	--	--	--	--	--	--
Area Recommended for Wilderness	Acres	--	--	--	--	--	--	107
Nonwilderness Dispersed Recreation Use in the 1st Decade								
Semiprimitive Nonmotorized	RVDs	--	--	--	--	76	76	--
	Acres	--	--	--	--	149	149	--
Semiprimitive Motorized	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	--
Roaded Natural	RVDs	--	--	--	--	--	--	--
	Acres	--	--	--	--	--	--	43
Roaded Modified	RVDs	285	285	285	76	--	--	--
	Acres	149	149	149	149	--	--	--
Trails								
Existing Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Potential Trails								
Full Protection Level	Miles	--	--	--	--	--	--	--
Moderate Protection Level	Miles	--	--	--	--	--	--	--
Low Protection Level	Miles	--	--	--	--	--	--	--
Visual Quality Objectives								
Preservation	Acres	--	--	--	--	149	149	107
Retention	Acres	--	--	--	--	--	--	43
Partial Retention	Acres	--	--	--	--	--	--	--
Modification	Acres	--	--	--	--	--	--	--
Maximum Modification	Acres	149	149	149	149	--	--	--
1st Decade								
Road Construction	Miles	--	0.2	0.5	--	--	--	0.1
Area Harvested	Acres	--	27	34	--	--	--	5
Programmed Timber Harvest	MBF	--	200	240	--	--	--	35
Area Remaining Undeveloped	%	--	44	27	--	--	--	--
Lands by Timber Yield Levels								
Full Yield (95-100%)	Acres	149	149	149	--	--	--	--
75-94% of Full Yield	Acres	--	--	--	--	--	--	--
50-74% of Full Yield	Acres	--	--	--	--	--	--	43
30-49% of Full Yield	Acres	--	--	--	--	--	--	--

APPENDIX D

STANDARDS AND GUIDELINES FOR ALL ALTERNATIVES

INTRODUCTION

The purpose of this Appendix (D) is to list those standards and guidelines (S&Gs) for alternatives which are different from those found in the Forest Plan, Chapter IV. S&Gs state the bounds or constraints within which all practices will be carried out in achieving the resource objectives of the alternatives. The management of the Forest is subject to all applicable laws and regulations. S&Gs are intended to help the manager achieve the goals and objectives, while staying within the constraints prescribed by law. Some of the management activities on the Forest could have adverse effects on the environment; the S&Gs provide mitigating measures for these activities.

Two categories of S&Gs are applied to management of the Forest: 1. Forest-wide S&Gs that apply to all management areas and 2. S&Gs specific to individual management areas. The area assigned to management areas varies widely and does not follow the allocations in the Forest Plan for other than the Preferred Alternative. In most instances, the direction for the management areas does not differ significantly between alternatives. A notable exception is the direction for riparian areas in management area 15.

The Forest-wide S&Gs for the Preferred Alternative are also found in Chapter IV of the Forest Plan. Most of the S&Gs in the Forest Plan are common to all alternatives and are not repeated here; the reader is referred to the Forest Plan document.

S&Gs THAT DIFFER FROM THOSE IN THE FOREST PLAN

The Forest-wide S&Gs and the management area-specific S&Gs in Chapter IV of the Forest Plan are applicable to all alternatives with the exceptions noted below.

Management Area Differences

Management area 15 S&Gs in Chapter IV of the Forest Plan apply only to Alternatives W (Preferred Alternative) and L. For Alternative D, all of the S&Gs apply except for Class III streams which would have timber harvest programmed at a rate of 5% of the suitable land per decade. Management area 15 direction would be modified for Alternatives K, A, J, and NC to allow 5% of the suitable lands along Class I and II streams and 7% of the suitable lands along Class III streams to be harvested during a decade. Approximately 21.5% of the lands along Class I, II, and III streams is identified as unsuitable to meet management requirements in all alternatives (see Riparian and Water discussions in Appendix B and Appendix G).

Forest-wide S&G Differences

Alternative NC

The NC Alternative would not adopt the S&Gs of the Forest Plan. The S&Gs for this alternative were established in the existing documents list below. This direction has not been revised to comply with the National Forest Management Act.

The Willamette National Forest Multiple Use Land Management Plan/Timber Management Plan FEIS (1977)

Belknap-Foley FEIS for Geothermal Development(1981)

Breitenbush II Geothermal EIS (1983)

Willamette Pass Alpine Winter Sports Site FEIS (1985)

Alternative K

Wildlife tree habitat would be maintained at 20% habitat capability levels at both the individual unit and the subdrainage level.

Less protection in the form of leave trees would be provided along Class IV streams and on potentially unstable slopes.

Most of biological diversity S&Gs would not apply.

Alternative A

Less protection in the form of leave trees would be provided along Class IV streams and on potentially unstable slopes.

Most of biological diversity S&Gs would not apply.

Alternative J

Less protection in the form of leave trees would be provided along Class IV streams and on potentially unstable slopes.

Most of biological diversity S&Gs would not apply.

Alternative W

The Forest Plan is based on Alternative W. All S&Gs in the Forest Plan apply.

Alternative D

Wildlife tree habitat would be maintained at 60% of habitat capability at both the individual unit and the subdrainage level.

Less protection in the form of leave trees would be provided along Class IV streams and on potentially unstable slopes.

S&Gs requiring 10 leave tree per acre on extended timber rotation management areas would not apply.

Alternative L

Wildlife tree habitat would be maintained at 60% of habitat capability at both the individual unit and subdrainage level.

S&G requiring 10 leave trees per acre would be extended to all management areas with programmed timber harvest.

APPENDIX E

WILD AND SCENIC RIVERS

BACKGROUND

The Wild and Scenic Rivers Act of 1968 (Public Law 90-542 as amended) established a method for providing Federal protection for certain of our remaining free-flowing rivers by preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides. Section 4(a) of the Act mandates that all rivers designated as potential additions to the system be studied as to their suitability for inclusion in the system.

In order to facilitate the study process, the Departments of Agriculture and Interior have developed a uniform evaluation and management approach: the *Guidelines for Evaluating Wild, Scenic and Recreational River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System Under Section 2, Public Law 90-542*. The Guidelines provide guidance for Forest managers during river study and land planning processes. Additional management direction is provided by the Land and Resource Management Planning Handbook (FSH 1909.12) and the Forest Service Manual 1924.

Rivers can be identified for study for potential inclusion in the Wild and Scenic River System by several means:

1. Federal statute that mandates Federal agencies to study a river pursuant to section 5(a) of the Act.

2. Identification for study by the Secretary of Agriculture or the Secretary of the Interior pursuant to section 5(d) of the Act.

3. The Nationwide River Inventory (NRI) developed by the National Park Service.

4. The land management planning process.

The study and assessment process follows a three-step procedure including:

- determination of eligibility
- potential classification
- determination of suitability

Eligibility of a river is determined by applying criteria ("free-flowing" conditions of the waterway and "outstandingly remarkable values" of the corridor, such as scenic, recreational, geological, fish and

wildlife, etc.) from the Act and from the USDA-USDI Guidelines and is primarily based on the professional judgement of an interdisciplinary study team. When a river or river segment is found to be eligible, it is given a potential classification of Wild, Scenic, or Recreation. The classification of a river is based on the conditions of the river and the adjacent lands. Determination of suitability is the final step in the river assessment. This step provides the basis for the decision to recommend designation or nondesignation of the river to the United States Congress . In Oregon, rivers can be designated as part of the National Wild and Scenic Rivers System through an Act of Congress or an Act of the Oregon Legislature and subsequent applications by the Governor of Oregon to the Secretary of Interior.

On the Willamette National Forest there are two Federally designated Wild and Scenic Rivers (W&SR) and two Federal Study rivers (see Table E-1). In addition, within the boundaries of the Forest are segments of rivers which have been designated as State Scenic Waterways. The Oregon Scenic Waterways program, established in 1970, is administered by the Oregon State Parks and Recreation Department (ORS 390.805-ORS 390.925).

Table III-O-2. Wild and Scenic Rivers[1]

River Name	National WSR	State Scenic Waterway	National WSR Study River
Little North Santiam		X	
McKenzie	X	X	
Blue River			X
South Fork McKenzie		X	
NF MF Willamette	X	X	

[1]See also Figure III-O-4 for location and extent of designated rivers.

Segments of Forest rivers have been evaluated for their eligibility as W&SR by the Forest interdisciplinary team. Further, each eligible segment has been assigned a potential classification of Wild, Scenic, or Recreation River as described in Table E-2.

Table E-2. Wild and Scenic River Classifications

Classification	Description
Wild	Free of impoundments Inaccessible except by trail or water surface Watershed or shorelines primitive Waters unpolluted
Scenic	Free of impoundments Shorelines largely primitive Accessible in places by roads Timber harvest may be practiced within the 1/4-mile corridor
Recreation	Readily accessible by road or railroad Some development along shorelines Some impoundment or diversion in the past Segments may be in or near urban areas Timber harvest may be practiced within 1/4-mile corridor

[1]See also Figure III-O-4 for location and extent of designated rivers.

Past and future input from the public has a significant influence on Forest management direction of potential W&SR. Public comment and response to the 1987 Draft Environmental Impact Statement were contributing factors in the Forest's decision to identify and evaluate potential W&SR.

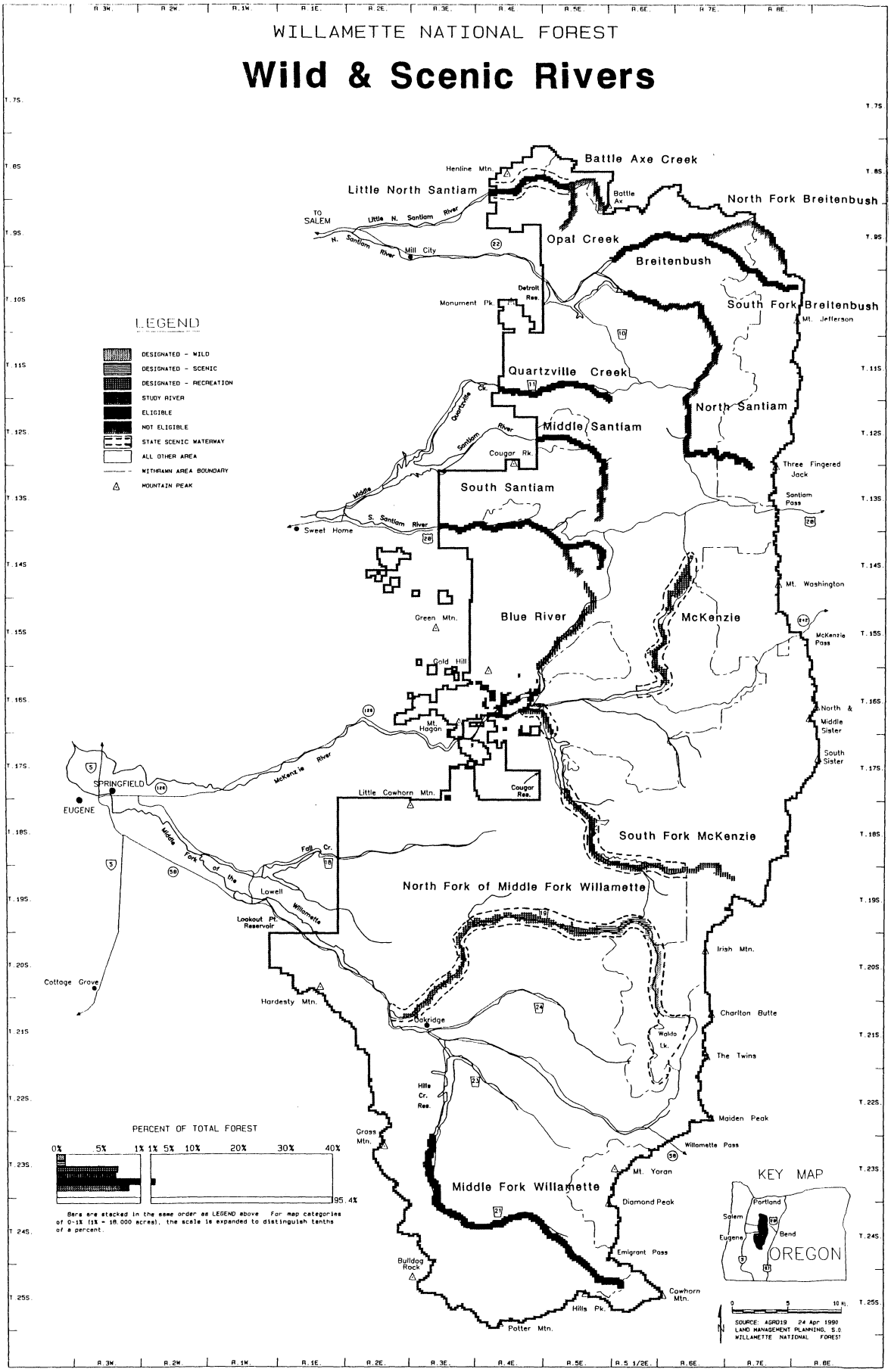
As a result of the identification and assessment process initiated by the Forest, 15 segments of eight rivers within the Forest boundaries have been considered eligible for WSR designation. Figure E-3 is a summary display of designation, eligibility, and classification status and related information of Forest rivers and Figure E-4 illustrates the location and extent of each river listed. Eligible rivers, Federally designated W&SR and Study rivers, and those rivers designated as State Scenic Waterways are described in the following narratives. For management direction which applies to these rivers or river segments refer to Chapter IV, Management Direction, Forest Land Management Plan.

Figure E-3. Eligibility and Classification Status of Forest Rivers

River	Segment Description	River Class	Outstanding Values	Miles	Acres[1]
Designated Wild and Scenic Rivers					
McKenzie River	Clear Lake to Carmen Reservoir	Recreation	Recreation Scenic, Fish Geology, H2O quality	1.8	749
	Carmen Dam to Trailbridge Reservoir	Recreation	"	4.3	1,789
	Trailbridge Dam to Scott Creek	Recreation	"	6.6	2,091
NF of the MF of the Willamette River	Waldo Lake to South Bdy. of Section 36	Wild	Recreation Scenic, Ecology Vegetation Geology, H2O Quality	8.8	2,820
	South Bdy. of Section 36 to Fisher Creek	Scenic	"	6.5	1,850
	Fisher Creek to Forest Bdy. near Westfir, OR.	Recreation	"	27.0	8,160
Designated Wild and Scenic Study Rivers					
Blue River	Headwaters to Blue River Reservoir	Recreation	--	8.5	2,720
SF of the McKenzie River	Headwaters to Wilderness Boundary	Wild	--	5.2	1,664
	Wilderness Boundary to Cougar Reservoir	Recreation	--	16.0	5,120
	Cougar Dam to confluence with the McKenzie River	Recreation	--	4.5	1,440
Eligible Rivers					
Little North Santiam River	Battle Axe Creek to Forest boundary	Scenic	Scenic	7.8	2,626
Battle Axe Creek	Headwaters to confluence with Opal Creek	Not eligible	--	5.0	1,727
Opal Creek	Opal Lake to confluence with Battle Axe Creek	Not eligible	--	4.0	1,493
North Fork Breitenbush River	Confluence with NF of NF and SF of NF to SF Breitenbush	Not eligible	--	6.6	1,941
	Headwaters of SF of NF to confluence with NF of NF Breitenbush	Not eligible	--	6.0	1,764
South Fork Breitenbush River	Russell Lake to Wilderness boundary	Wild	Scenic, Wildlife	4.0	1,749
	Wilderness boundary to Breitenbush River	Scenic	Scenic, Wildlife	6.5	1,834
Breitenbush River	North Fork Breitenbush River to Detroit Reservoir	Recreation	Recreation	10.5	3,200

North Santiam River	Headwaters to Wilderness boundary	Wild	Wildlife	3.8	1,450
	Wilderness boundary to Highway 22	Scenic	Scenic	4.2	1,088
	Highway 22 to Rainbow Creek	Recreation	Ecology	19.5	6,912
	Rainbow Creek to Detroit Reservoir	Not eligible	--	3.5	1,130

Figure E-4.


WILLAMETTE NATIONAL FOREST
Wild & Scenic Rivers
LEGEND
DESIGNATED - WILD
DESIGNATED - SCENIC
DESIGNATED - RECREATION
STUDY RIVER
ELIGIBLE
NOT ELIGIBLE
STATE SCENIC WATERWAY
ALL OTHER AREA
WITHDRAWN AREA BOUNDARY
MOUNTAIN PEAK
Battle Axe Creek
Little North Santiam
North Fork Breitenbush
Opal Creek
Breitenbush
South Fork Breitenbush
Quartzville Creek
North Santiam
Middle Santiam
South Santiam
Blue River
McKenzie
South Fork McKenzie
North Fork of Middle Fork Willamette
Middle Fork Willamette
Henline Mtn.
Battle Ax
Mill City
Detroit Res.
Monument Pk.
Mt. Jefferson
Cougar Pk.
Three Fingered Jack
Santiam Pass
Sweet Home
Green Mtn.
Mt. Washington
McKenzie Pass
Gold Hill
Mt. Hagan
North & Middle Sister
South Sister
SPRINGFIELD
EUGENE
Little Cowhorn Mtn.
Cougar Res.
Lookout Pt. Reservoir
Lowell
Cottage Grove
Hardesty Mtn.
Oakridge
Irish Mtn.
Charlton Butte
Waldo Lk.
The Twins
Hills Cr. Res.
Maiden Peak
Willamette Pass
Grass Mtn.
Mt. Yoran
Diamond Peak
Emigrant Pass
Bulldog Rock
Cowhorn Mtn.
Hills Pk.
Potter Mtn.
PERCENT OF TOTAL FOREST
0% 5% 1% 1% 5% 10% 20% 30% 40%
95.4%
Bars are stacked in the same order as LEGEND above. For map categories of 0-1% (1% = 18,000 acres), the scale is expanded to distinguish tenths of a percent.
KEY MAP
Portland
Salem
Eugene
Bend
OREGON
SOURCE: AGR019 24 Apr 1990
LAND MANAGEMENT PLANNING, S.O
WILLAMETTE NATIONAL FOREST

MCKENZIE RIVER

DESIGNATED NATIONAL WILD AND SCENIC RIVER

State of Oregon Willamette National Forest Lane and Linn Counties

The McKenzie River is designated as included in the National W&SR System by the Oregon Omnibus Wild and Scenic Rivers Act of 1988. This River is also included in the Oregon State Scenic Waterways System.

Description

Location and Access:

The McKenzie River is located in the Central Oregon Cascades. The river originates at Clear Lake, and flows south and west through the Forest.

The portion of the McKenzie River (T. 14, 15 and 16S., R.6E.) that is included in the National W&SR System begins at the headwaters from Clear Lake and terminates at Scott Creek.

Access to the river is easily attained by State Highway 126 and Clear Lake Highway which parallels the river. This corridor is approximately 12.7 miles long. The McKenzie River National Recreation Trail also accesses the river, Forest Roads 2650, 2654, 2655-140, and 655 bridge the river.

Designation and River Mileage:

Segment 1. The 1.8-mile segment from Clear Lake to the head of maximum pool at Carmen Reservoir as a recreational river;

Segment 2. The 4.3-mile segment from a point 100 feet downstream from Carment Dam to the maximum pool at Trail Bridge Reservoir Dam to Scott Creek as a recreational river; and

Segment 3. The 6.6-mile segment from the developments at the base of Trail Bridge Reservoir Dam to Scott Creek as a recreational river.

Outstandingly Remarkable Values:

The McKenzie River possesses numerous outstandingly remarkable values: prominent recreational opportunities, spectacular scenery, unique geologic attributes, diverse fish population and habitat.

The McKenzie River endures a national reputation for its outstanding scenery, cold, clear water, and magnificent vegetation. The McKenzie is an important and valuable river to Oregon in terms of challenge to the skills of whitewater rafters, kayakers, and driftboat users. Its close proximity to the Eugene-Springfield area help make it one of the most popular developed and dispersed recreational areas easily accessible from the Willamette Valley, and is also classified as a Scenic Waterway by the State of Oregon. Another highlight is the 26-mile McKenzie National Recreation Trail which provides recreation opportunities and allows easy accessiblity to some spectacular geological phenomenon. The river corridor has not been systematically surveyed to identify cultural resources but it has a high potential to bear prehistoric cultural resources.

Landownership: Willamette National Forest		River Miles Approx. Acres
Clear Lake to Carmen Reservoir	1.85	749
Carmen Dam to Trailbridge Reservoir	4.3	1,789
Trailbridge Reservoir to Scott Creek	6.6	2,091
Total		**4,629**

Mineral and Energy Resource Activities:

There are no mining activities or claims within the corridor, although there are several existing Forest Service rockpits which have varying degrees of development.

Cal Energy has two applications for geothermal leases in T.14S., R.7E sections 4,9, and 16 but the leases have not been granted. This area is included in the Belkap-Foley Geothermal Area Final EIS.

A power license to Eugene Water and Electric Board (EWEB) withdraws 2,700 acres from mineral entry. However, the mineral potential in this area is low or unknown.

Water Resource Developments:

Carmen-Smith and Trail Bridge Dams and Reservoirs located along the upper McKenzie Corridor are components of a 90 megawatts Eugene Water and Electric Board (EWEB) hydoelectric project. A power project license is held by EWEB on about 2700 acres. The generators are located in the vicinity of Trail Bridge Reservoir and supply electricty to the city of Eugene. The Carmen-Smith and Trail Bridge facilities combined produce about 12 percent of the total EWEB system use.

Transportation Facilities and Other Developments:

In addition to State Highway 126, a paved two-lane road which parallels the river throughout the designated section, the dam and power generation facilities mentioned above, there are other developments within the corridor. Highway 126 is visible from the river in a few areas, but in most instances it is fairly well buffered from the river by vegetation.

There are numerous recreation opportunities and developments in the river corridor and they include:

- Three developed Forest Service campgrounds with 65 developed sites, two highly developed scenic viewpoints, two developed boat launches, a national recreation trail that traverses the entire segment, numerous dispersed recreation sites, and undeveloped hot springs.

- There are several bridges scattered across the McKenzie and they are Frissell-Carpenter Forest Road 2650, Deer Creek Forest Road 2654, and Trail Bridge Forest Road 730. Two trail bridges built for the McKenzie National Recreation Trail also cross the McKenzie in the designated segment.

Recreation Activities:

The McKenzie is renowned for its scenic beauty and recreational opportunities and has a very high recreational value. Approximately 2/3rds of the states population live within a three hour drive of the river. The quality of the upper McKenzie is quickly being discovered and the recent National W&SR designation may enhance interest and recreational uses of the corridor. The McKenzie River National Recreation Trail offers a unique and quality recreational experience for visitors to explore the McKenzie River corridor. The recent addition of the McKenzie-Santiam National Scenic Byway will also emphasize the scenic features of the McKenzie River. Recreation use is predominantly camping, sightseeing, hiking, fishing, and whitewater boating.

Recreation use of Forest Service facilities and lands within the corridor during 1988 was as follows:

Camping	71,300
Fishing, Sightseeing	66,350
Whitewater Floating	2,500
Guided Service Days	2,090

Wildlife and Fish:

The McKenzie river corridor is known to inhabit many wildlife species and a majority of the area lies within winter range for big-game. The sensitive species are being managed by specific designations to protect their habitat by mature and old-growth timber. It includes a spotted owl habitat area, pine marten network area, pileated woodpecker habitat area, and a special wildlife area. There are several known osprey nests and bald eagle activity has been witnessed but no nests have been located.

Spring chinook salmon and steelhead runs are present in the McKenzie River up to Trail Bridge Dam. A unique feature downstream from Trailbridge Dam is a Chinook salmon spawning facility maintained by EWEB.

Streamflow:

Flows reach maximum during spring snowmelt, with up to 2,500 cubic feet per second (cfs) average. From late summer through early winter, flows average at approximately 1,100 cfs. These figures for the river are taken from the guage at 1.7 miles east of McKenzie Bridge. Trail Bridge dam serves as a regulating reservoir to provide an even flow of water in the McKenzie below the dam.

Streamflow above Trail Bridge reservoir is relatively complex. The McKenzie River officially begins at the outlet to Clear Lake. From that point to Carment Diversion Reservoir the river flows normally. At Carmen Reservoir the McKenzie is diverted, via tunnel, to Smith Reservoir which provides the hydrolic head for the generators located on Trail Bridge regulating facility. From Carmen Dam downstream to Tamolich Falls the old river bed is essentially dewatered. Presently only during major runoff events does the river flow over the lip of the falls.

From a historical perspective this may not be an unusual situation. In the past the McKenzie regularly disappeared into the highly permeable lavas of Tamolitch Valley during the summer months only to reappear as a full fledged river in the pool below Tamolitch Falls. While the flow in the dry channel is variable during the winter and spring (from a few hundred yards to 1/2 mile, and rarely over the falls) the river stills flows from Tamolitch pool.

Geology:

The upper McKenzie River Basin is fascinating because it has undergone several violent transformations in the recent geological past. The basin was the site of frequent volcanic activity and the river has cut through numerous layers of tuff (consolidated volcanic ash) and basalt flows. A geologically recent basalt flow is responsible for the formation of Clear Lake and the course of the McKenzie River has been altered by lava flows. Lava flows which poured from the Belknap Crater dammed up part of the McKenzie creating the spectacular Sahalie and Koosah waterfalls.

Botany:

The river contains significant old growth stands of true fir forests and the species transform quickly in spots where the lava flows are prominent to a drier species functioning on less water. Douglas Fir, Western Hemlock, Western Red Cedar, Incense Cedar, and Lodgepole Pine are some of the species that occur in the river corridor. Hardwood species such as big leaf maple and alder occur throughout the drainage. Significant understory species include vine maple, oregon grape, rhododendron, braken fern, swordfern, oxalis, and vanilla leaf.

Presently there are no threatened and endangered species confirmed along the designated National W&SR System river corridor.

Cultural Resources:

In the Mckenzie River corridor, a total of nine prehistoric sites have been found and recorded. Historic resources include 1930's Civilian Conservation Corps. (CCC's) projects, (culverts, buildings, etc...). There has not been a systematic search of the corridor area, but future plans include a full survey of the area adjacent to the McKenzie for additional prehistoric and historic resources.

Timber:

The McKenzie River corridor is being modeled in the proposed Forest Plan without programmed harvest to respond to the management intent for this area prior to designation as a W&SR and to fully respond to the public's concern for this rivers outstanding values.

Livestock Grazing:

There are no grazing allotments within the river corridor.

Socioeconomic Effects:

The upper McKenzie River corridor local economy is largely dependant on both tourism and wood products. There is a significant amount of retired and leisure homes below the designation and this growth of housing has continued to increase recently. Designation of the McKenzie River will protect or enhance river values and likely will benefit those with work and live along the river.

NORTH FORK of the MIDDLE FORK of the WILLAMETTE RIVER

Designated National Wild and Scenic River

State of Oregon Willamette National Forest Lane County

The North Fork of the Middle Fork of the Willamette River is designated as included in the National Wild and Scenic River System by the Oregon Omnibus Wild and Scenic Rivers Act of 1988. The river is also included in the Oregon State Scenic Waterways Systems.

Location:

From the outlet of Waldo Lake downstream approximately 42.3 miles to the National Forest boundary near Westfir, Oregon.

Segment 1. The North Fork of the Middle Fork of the Willamette River, from its outlet of Waldo Lake downstream approximately 8.8 miles to its intersection with the south section line of Section 36, T19S, R5-1/2 E of the Willamette Meridian.

Segment 2. North Fork of the Middle Fork of the Willamette River, from its intersection with the south section line of Section 36, T19S, R5-1/2 E of the Willamette Meridian, downstream approximately 6.5 miles to Fisher Creek.

Segment 3. North Fork of the Middle Fork of the Willamette River, from Fisher Creek downstream approximately 27 miles to the National Forest boundary, upstream from the Southern Pacific bridge near Westfir, Oregon.

Designated segments:

Segments 1, 2, and 3.

From the outlet of Waldo Lake downstream to the National Forest boundary near Westfir, Oregon. (42.3 miles)

Outstandingly Remarkable Values:

Inventory and study of the North Fork of the Middle Fork of the Willamette River for Oregon State Scenic Waterways designation revealed attributes that are important to this waterway and set it apart as "special" among the State's Waterways.

Water Quality.

Water quality is probably the most outstanding attribute of both Waldo lake and the river. The level of purity of the lake is equal to laboratory distilled water. Waldo Lake, included in the state's designation, is regarded by some experts as one of the purest lakes in the world.

Recreation.

The variety of recreational experiences available on the North Fork W&SR are an important attribute. For example, primitive, remote forest areas are available for hiking and fly fishing for wild trout in crystal clear water amid towering Douglas-fir trees. The State of Oregon currently manages the North Fork as a wild trout river and restricts angling to fly fishing only. The river is well known to local anglers as a high quality fly fishing area.

During high flows, the river is moderately used by local rafters. The lower 8 or 9 miles of the river are heavily used during the summer for swimming and picnicking by residents of Oakridge and Westfir.

There is one campground on the North Fork, Kiahanie Campground, which is about 24 miles upstream from the city of Westfir. There are 39 dispersed campsites, mostly in the middle section of the river (from Road 1920 to Fisher Creek), that are heavily used during the summer and fall months by campers, anglers and hunters.

The Constitution Grove Commemorative Site was established along Forest Road 19 in 1987. The 200 year old Douglas-fir stand commemorates the many individuals who signed the U.S. Constitution.

Several Forest Service trails parallel the upper 9 miles of the North Fork with the Shale Ridge Trail (#3567) being a major trail in accessing the Waldo Lake Wilderness Area. Plans have also been made to construct a trail that will parallel the North Fork from Westfir to the beginning of the Shale Ridge Trail.

Natural Features.

The outstanding and unique natural features of the river and related adjacent lands are another attribute. Among these unique natural features is a steep river canyon that drops 2,400 feet in 6 miles and has 34 waterfalls. The Cedar Bog area, in the upper North Fork Canyon below Waldo Lake, was formed by a glacial moraine. There is also a large flood plain along the middle portion of the river that is up to 1/2-mile wide which is, for the most part, covered with a diverse riparian forest containing trees up to 600 years old.

The lower 12 miles of the North Fork flows through a steep canyon approximately 1,000 feet deep. This canyon is the result of the river eroding through a large ancient lava flow that filled the North Fork's ancestral valley. In many places within the canyon, the river flows on bedrock and has in places formed deep pools in hard bedrock.

Historic and Cultural Resources.

The North Fork has been an important travel and hunting route for nearly 10,000 years. Evidence remains of the early logging railroads and Civilian Conservation Corps work.

Threatened and Endangered Animal and Plant Species.

Another feature is the unusual variety of wild plant and animal life. The North Fork is home to several threatened and endangered species (both State and Federal lists) such as the wolverine, fisher, bald eagle, northern spotted owl, bog orchid, coralroot orchid, mountain lady slipper and others.

River Mileage:

Approximately: 42.3 miles

Classification:

Segment 1	Designated Wild	8.8 miles
Segment 2	Designated Scenic	6.5 miles
Segment 3	Designated Recreation	27.0 miles

Landownership:

All of the lands adjacent to the Federally designated W&SR are National Forest System Lands. State designation includes the entire river. The lower 2.0 miles from the end of the Federal designation to the confluence with the Middle Fork is privately owned by a variety of people.

	River Miles	Corridor Acres
Willamette National Forest	42.3 miles	12,830 acres

Mineral and Energy Resource Activities:

Mining activity has been limited on the North Fork to historic claims around Christy Creek, which are outside of the W&SR corridor. However, within the corridor there are 36 claims that have been recorded with no notices of intent filed.

Recent mineralogical studies by the Oregon Department of Geology and Mineral Resources on the Fall Creek Mining District 1983, have indicated that several metals including gold, silver and copper may be present in commercially recoverable quantities within the W&SR but more likely in better concentration in the Christy Creek subdrainage.

There is one Forest Service rockpit in the W&SR corridor which is currently being rehabilitated to be less visually apparent. No geothermal, oil or gas leases or lease applications exist in or near the W&SR corridor.

Water Resource Developments:

There are no active hydropower permits in the vicinity of the North Fork River corridor. Several preliminary hydropower permits had been issued in 1982 and 1983 but as of 1986 all permits were surrendered.

Transportation Facilities and Other Developments:

Forest Service Road 19 (Aufderheide Forest Drive) is a paved double lane road and is a designated Scenic Byway which parallels Segments 2 and 3 for approximately 30 miles. The road is the approximate

center of a managed scenic corridor and a number of interpretive signs exist explaining forest management practices. Approximately 20-30 percent of the North Fork (Segment 3) is not well buffered by vegetation from the road.

A number of administrative facilities exist along the W&SR corridor. These developments include:

Eight concrete bridges cross Segment 3 of the river. These are located above Short Creek, 1/2-mile above Dartmouth Creek, below intersection of Forest Service Road 1919, above FS Road 1920, below confluence of Christy Creek, 3/4-mile above confluence of Christy Creek, 1/2-mile above Kiahanie Campground, and 3/4-mile below confluence of Fisher Creek. Three of the eight cross the North Fork river on Forest Service Road 19 at mile post 11.8 (Lower Gorge Bridge) at the entrance of a narrow gorge, mile post 12.7 (Upper Gorge Bridge) leaving the gorge and at mile post 23.6 (Brock Bridge).

Shale Ridge Trail #3567 parallels approximately 1 mile of upper Segment B and approximately all of Segment 1.

Forest Service recreation developments include 1 campground. Approximately 39 heavily used disperse recreation sites in the upper half of Segment 2 are accessed by many low standard timber access roads and segments of the Old Box Canyon road.

Many Forest Service collector roads lead from Forest Service Road 19 to adjacent lands managed for timber production. Numerous timber harvest activities have taken place along the corridor with some visible from the river and road 19.

Segment 3 ends at the National Forest Boundry and mile post 3.1 of Forest Service Road 19. Located in the near vicinity is a water intake pipe, water treatment facility, old water diversion structure and water tank for the City of Westfir. Also a covered bridge crossing the North Fork River, accessing an old mill site, is in this vicinity.

Along the lower part of Segment 3 are portions of an old abandon railroad grade. This railroad was used to access logging sites and transport logs to the mill in Westfir.

An environmental assessment has been prepared for the construction of a trail parallelling the river from the Forest Boundary to the Shale Ridge trailhead.

Recreation Activities:

The North Fork of the Middle Fork of the Willamette has a very high recreation value. Approximately two-thirds of the State's population live within a 2.5-hour drive of the river. Recreation on the river includes camping, hiking, hunting, swimming, fly fishing, sight-seeing, biking and boating.

Recreation Activities (Estimated Recreation Visitor Days - RVD's):

		Year 1989	Year 2000
Whitewater boating		100	1,200
Fishing		2,000	4,000
Camping:	developed	12,000	24,000
	dispersed	13,000	26,000
Hiking		200	3,000
Viewing scenery		15,800	31,000
Biking		200	1,200
Swimming		700	1,400
Total	**44,000**	**91,800**	

Wildlife and Fisheries:

The entire length of Segment 3 and portions of Segment 2 provide big game winter range habitat. Several Roosevelt elk herds use all or portions of the W&SR corridor during the winter, along with blacktail deer, black bear and cougar. These latter also use the area on a year-round basis. The lower 14 miles of the North Fork provides different quality of habitat due to young Douglas-fir stands resulting from the logging that occurred during the 1920's and 1930's.

Smaller mammals common in the North Fork riparian area include coyotes, bobcats, beaver, mink, river otters, flying squirrels, snowshoe hares and numerous species of chipmunks, squirrels, mice, voles and shrews. Wolverines, fishers and pine martins are also seen occasionally in the upper reaches of the North Fork near Waldo Lake.

A large variety of birds can be found along the North Fork, including northern spotted owls, pileated woodpeckers, water ouzel, ducks of various kinds, osprey, grouse and quail. Bald eagles, though they do not live in the area, are sometimes seen traveling along the river during migration season. The upper third of Segment 3, the entire portion of Segment 2 and the lower 2 miles of Segment 1 provides an old growth forest habitat suitable for the northern spotted owls. Approximately 6 miles of the North Fork flows through or adjacent to areas designated by the Forest as Spotted Owl Habitat Areas.

The North Fork previously supported steelhead and chinook salmon runs which were stopped by the Hines Lumber Co. dam built in Westfir in the early 1950's. Dam construction on the lower Middle Fork near Lowell, Oregon has further blocked anadromous fish movement.

Rainbow trout were stocked in the river until the mid 1970s. The Oregon Department of Fish and Wildlife now manages the North Fork as a wild trout river. Angling is restricted to fly fishing only.

Streamflow:

The outlet of Waldo Lake is the headwaters of the North Fork of the Middle Fork of the Willamette River. Waldo Lake has a relatively small watershed with water replenishment by rain, snow melt run-off and subsurface run-off as there are no permanent inlet streams. Due to its small watershed, it takes almost 30 years of run-off and precipitation to completely replace the water volume in Waldo Lake. A gauging station recording daily outflow is maintained by the U.S. Geological Service at the outlet of Waldo Lake (beginning of the North Fork). Measurements range from a low of 0 CFS to a high of 143 CFS, with an average annual flow of 35 CFS.

From Waldo Lake downstream, the flow in the North Fork gradually increases due to numerous tributaries. Several underground sources add substantially to the stream. The largest tributary is Christy Creek which joins the river near Forest Service Road 1926 (Segment 3). The North Fork watershed totals 246 square miles. The river drops 4,400 feet over its 42.3 length. The first 6 miles drops 2,400 feet in elevation.

Nearly all of the "sediment" carried by the river is coarse gravel and rock; the only serious bank erosion is occurring at the toe of two recent slides near the main USFS road. The average daily flow recorded on the lower river at the town of Westfir has a minimum daily flow of 84 CFS, maximum daily flow of 19,320 CFS, with an average annual daily flow of 789 CFS.

Geology:

Much of the present North Fork River canyon has been altered by glacial action, slides and intercanyon lava flows. As alpine glaciers moved down the canyon, the ice carved and undercut many of the lava and tuff layers. When the glaciers receded, they left behind many glacial features like the water falls of the upper segments of 1 and 2, and the moraine in the upper North Fork Canyon below Waldo Lake that blocks the river to form Cedar Bog. Segment 2 also contains a large flood plain along the middle portion of the river that is up to 1/2 mile wide.

As the glaciers melted, they caused numerous slides and slumps. One of these slides blocked the river between the first and second bridge at milepost 9 and is known as the Gorge. The lower 12 miles of the river flows through a steep canyon approximately 1,000 ft. deep. This canyon is the result of the river eroding through a large lava flow that filled the N. Fork's ancestral valley. In many places the river flows on bedrock and has formed numerous deep pools in hard bedrock.

Botany:

The upper five miles of the river flows through Pacific silver fir and mountain hemlock forests. Typical understory species in these forests include devils club in the wettest areas, huckleberries, bunchberry, foamflower, bead lily and false-solomans seal.

At 3,000 feet in elevation, the river flows through a large and very unique marsh/bog complex that is approximately 160 acres in size. This marsh contains a large variety of plant life including dense sitka alder and willow brush fields, sedge and grass meadows, skunk cabbage and vine maple swamps, as well as a large variety of other flowering herbs typical of wet meadows. Nearly pure stands of western redcedar and grand fir occur along the edges of the marsh. The stream channel itself contains a relatively large number of plants due to its low gradient in the marsh. Four species of flowering aquatic plants grow on the bottom gravels and rock along with several species of moss.

Below about 3,200 feet the river flows mostly through Douglas-fir/western hemlock forests. These forests also contain smaller amounts of grand fir, incense cedar, redcedar, cottonwood, red alder and bigleaf maple. These last 3 trees tend to grow most often on the banks of the river or near associated wetlands. From river mile 17.5 to 36, these forests are composed mostly of old-growth stands that range in age from 250 to over 600 years old, with the exception of the 15 percent of the area which has been harvested and converted to young plantations. Understory vegetation in these older stands is composed mostly of vine maple, Pacific rhododendron, salal, Pacific yew, sword fern, and Oregon grape, along with a fairly diverse set of herbaceous species. At river mile 20, there is a grove of especially tall Douglas-fir which range from 240 to 270 feet in height.

From river mile 2 to 17.5, the river flows through dense second growth Douglas-fir stands which have understory vegetation dominated by salal, vine maple and sword fern. This stretch of the corridor also contains small amounts of several introduced plants, including Himalayan blackberry, tansey ragwort, scotch broom and foxglove.

Between river mile 22 and 27, there are several meadows that are within the river corridor but at some distance from the river. These meadows contain a variety of plants types; dry areas are dominated by grasses, service berry and oceanspray; wetter areas are dominated by sedges and dense spirea brush fields. Several native ponderosa pine occur in the dry areas, the only known native occurrence of this tree in the North Fork watershed. There have been reports of quaking aspen, which generally only grows on the east side of the Cascades, growing in one of the spirea swamps but this has not been verified in recent years. Buffalo Rock, located near river mile 21, supports a dry rock garden plant community which contains a number of ferns, mosses and spring ephemeral flowering plants adapted to extremely dry conditions. This area also contains rabbit brush, another plant generally found only on the east side of the mountains.

There have been no plants found within the W&SR corridor which are classified as threatened, endangered or sensitive by the U.S. Fish and wildlife Service or the Forest Service. There is potential for several species to occur in some of the non-forest vegetation types, including: *Lycopodium annotinum*, *Ophioglossum vulgatum*, *Agoseris elata*, *Allium campanulatum*, *Arnica viscosa*, *Asplenium septentrionale*, *Phacelia verna*, and *Pellaea andromedaefolia* and one species, *Montia diffusa*, which could occur in the more general habitat of forested moist areas.

Cultural Resources:

The Forest Service has identified at least six archaeological sites on the North Fork with 4 sites being within the W&SR designation. Evidence from these sites indicate that Indians (8,000 - 10,000 years) used the areas for hunting, food gathering and as a travel route across the Cascades.

Early logging activities on the North Fork are still evident today. Near Eighth Creek, the Western Lumber Co. of Westfir and Oakridge built an inclined railroad about 1924-1925 that utilized a "steam donkey" and "snubber" to move rail cars up and down this 72 percent grade incline. At other locations along the river there are remnants of the trestle that once supported the railroad that was used to transport logs from the North Fork drainage.

In the vicinity of Christy Creek, early miners operated a stamp mill with the power generated by a 30 foot diameter cedar waterwheel fed through a flume.

The Civilian Conservation Corp. (CCC's) operated out of a camp near Brock Creek while they constructed campgrounds at Kiahanie, Skookum Creek, North Waldo Lake and Taylor Burn. They also built part of the North Fork road from Box Canyon to Skookum Creek.

Timber:

Segment 3 contains 40-50 year old stands of Douglas-fir that regrew after the railroad logging occurred in the lower 14 miles of the canyon during the 1920s. This young timber is just beginning to be commercially thinned. The upper portion of Segment 3 and Segment 2, totaling about 22 miles, contains old growth Douglas-fir, western hemlock and red cedar. Approximately 15 percent of this area has been harvested within the last 30 years. This area supports young plantations of Douglas-fir from 1 to 30 feet in height. The portion of this river corridor in the commercial forest land base contains approximately 221 million board feet of timber.

The annual sale quantity for the Recreation and Scenic portions of this W&SR are estimated to be 1.8 MMBF.

Livestock grazing:

The river corridor is not located within any existing grazing allotment.

Socioeconomic Effects:

Due to the current Forest Service strategy of increased marketing of the Aufderheide Forest Drive and National Scenic Byway, an increase in tourism is anticipated. However, with a W&SR designation, a much greater increase in tourism may occur with a corresponding increase in tourism related businesses in the Westfir and Oakridge area.

Current management and management under the prepared Forest Plan limits timber harvest in the corridor. The designation of the North Fork as a W&SR will result in slightly lower timber harvest levels in the corridor.

The North Fork of the Middle Fork corridor begins about 45 miles from the Eugene/Springfield metropolitan area. The local economy is relatively dependent upon the timber industry with tourism increasing in importance.

Current Administration:

The entire designated river corridor is currently managed by the Forest Service, Oakridge Ranger District.

Funding Needs as a Wild and Scenic River:

The following are anticipated funding requirements for the North Fork of the Middle Fork of the Willamette River for the first five years:

	Expenses Expected Independent of Designation	**Additional Expenses Expected with Designation**
General Administration	$ 25,000	$ 6,250
Costs of Implementation	-0-	6,000
Development of Management Plan	-0-	45,000
Development Costs	289,000[1]	-0-
Operation and Maintenance Costs	89,000	10,500
Total - First 5 Years $	**403,000 $**	**74,750**

[1]Development costs include a campground in Segment 3 and a trail running parallel to Segment 2 and 3 with a horse loading ramp.

Forest Plan Alternatives:

None of the alternatives in the DEIS and Draft Forest Plan recommended National W&SR designation for any segment of the North Fork of the Middle Fork of the Willamette River. Plan references refer to the North Fork of the Middle Fork of the Willamette River as included in the Oregon State Scenic Waterway System, October 1983.

BLUE RIVER

Designated Wild and Scenic Study River

State of Oregon Willamette National Forest Linn and Lane Counties

The Blue River is proposed for study as a potential Wild and Scenic River. This river was designated for study by the Oregon Omnibus Wild and Scenic River Act of 1988. A study team on the Willamette National Forest is currently evaluating Blue River to determine its eligibility and suitability for inclusion into the National System.

Location:

From the headwaters to the confluence with the Mckenzie river.

Segment 1: From its headwaters at the junction of Mann Creek and Wolf Creek in the NE1/4 of Section 2, T.15S., R.5E. to the Blue River Reservoir in the NW1/4 of Section 6, T.16S., R.5E. (approximately 8.5 miles).

Potential for Designation:

From the headwaters of Blue River downstream to Blue River Reservoir (segment 1).

River Mileage:

Study:	- 8.5 miles
Eligible:	- 0.0 miles
Draft Forest Plan:	- 0.0 miles

Outstandingly Remarkable Values:

Upper stream area has a number of bedrock cascading falls, 6-10 feet high along with numerous pools and riffles. River flows along areas of mature/old growth Douglas-fir. Lower section of the river contains deep bedrock pools, cliffs and canyons with excellent water clarity.

Potential Classification:

Segment 1	Recreational	8.5 miles

Landownership:	**River Miles**	**Corridor Acres**
Willamette National Forest	8.5 miles	2,720 acres

Mineral and Energy Resource Activity:

There are no known mining claims within the corridor of the river. No interest has been expressed in mineral exploration or development, and the lands within the corridor have low mineral potential,

making entry unlikely. There are no geothermal leases in the area with low potential for any geothermal development.

Water Resource Developments:

There are no existing impoundments nor potential water resource development sites located in the corridor. Blue River Reservoir is immediately down stream. In 1985 a small earthen dam broke on private land sending a large flow of water down Mann Creek into the headwaters of Blue River causing some stream scouring along the upper section. Along the lower section a small hand operated cable car is located for research purposes for the H.J. Andrews. Along this same section are water gaging stations on minor tributaries from research areas on the H.J. Andrews.

Transportation, Facilities, and Other Developments:

Forest Development Road 15, is a paved, two-lane road for the first 1.5 miles and then becomes a gravel surfaced road. It parallels the river for all of its length, providing access to the river. Along the lower 5 miles the road is visible from the river in certain areas. Numerous timber harvest activities have taken place and are readily apparent from the river. There are a number of dispersed recreation sites located along the lower 1.5 miles of this river.

Recreation Activities:

Overall, compared to the south end of the district, the Blue River corridor does not receive much recreation traffic. What it does receive is concentrated in the lower section, especially the last 2 miles. Above Blue River Reservoir there are no developed campgrounds or established hiking trails. Fishing is the major recreation use. Directly above the headwaters is Wolf Rock, the second largest monolith in the world. It receives moderate use from rock climbers with principle access to this area along the river corridor.

Recreation Activities (Estimated Recreational Visitor Days - RVD's)

Activity	**1989**	**2000**
Fishing	10,000	12,000
Camping	7,500	10,000
Picnicking	3,000	5,000
Total	**20,500**	**27,000**

Wildlife and Fisheries:

The river corridor is important big game winter range. Mature/old growth Douglas-fir along stream is suitable as a spotted owl nest area and 2 foraging habitat. Blue River is stocked with rainbow trout by ODFW. Native cuttroat trout are present, however, spawning gravels is low to moderate, especially in lower half of stream.

Streamflow:

The river's annual flow is approximately 390 cfs with high fluctuations in flows. High flows occur in winter and spring from rainfall and snow melt.

Low base flow in summer occurs in August and September with flows of 15 - 20 cfs. January flows average 800 - 1200 cfs.

Geology:

Andesite and basalt bedrock pools 12 feet deep, cliffs and canyons 15-20 feet high are scattered along the stream course in the lower 5 miles of the stream. The upper section is mainly alluvial material, cobbles, stones, boulders, and gravels. There are four bedrock cascading falls, 6 -10 feet high.

Cultural Resources:

The study corridor includes high probability zones with good potential for bearing prehistoric cultural resources. There are six archeological sites (lithic scatters), and 3 isolated artifacts.

Timber:

The portion of the river corridor that is eligible for Recreation River designation includes about 2,720 acres. Stands of mature/old growth Douglas-fir, and western hemlock occupy the area. Estimated ASQ without River designation is 2.5 MMBF and 2.3 MMBF if the area were designated as a Recreation River.

Socio-Economic Effects:

The Blue River is close to the Eugene/Springfield metropolitan area. The local economy is dependent on both timber industry and tourism. Designation as a Wild and Scenic River should increase recreational use due to enhanced name recognition. Current management and the preferred alternative restrict timber harvest in the lower corridor. Designation as a Wild and Scenic River would lower timber harvest in the corridor.

Current Administration:

The study segment of the river is currently managed by the Willamette National Forest along it's entire length.

Funding Needs If Classified as a Wild and Scenic River:

The following are expected funding requirements for Blue River for the next 5 years:

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expenses Expected with Designation**
General Administration	$ 15,000	$ 8,000
Costs of Implementation		10,000
Development of Management Plan		130,000
Development Costs	50,000	
Operation and Maintenance	35,000	5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance costs are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

The DEIS and Draft Forest Plan did not recommend designation of Blue River as a Wild and Scenic River. The Draft Forest Plan, however, recommends designation of the upper corridor as a scenic foreground.

SOUTH FORK MCKENZIE RIVER

Designated Wild and Scenic Study River

State of Oregon Willamette National Forest Lane County

The South Fork Mckenzie River is proposed as a potential Wild and Scenic River. This river was designated for study by the Oregon Omnibus River Act of 1988. A study team on the Willamette National Forest is currently evaluating the South Fork McKenzie River to determine its eligibility and suitability for inclusion in the National System.

Location:

From the headwaters in the Mink Lake Basin to the confluence with the Mckenzie River.

Segment 1. From its headwaters located in Beaver Marsh, part of the Mink Lake Basin, in T.19S., R.7E., NW1/4 of Section 6 down to the Wilderness boundary (approximately 5.2 miles).

Segment 2. From the Wilderness boundary to Cougar Reservoir (approximately 16.0 miles)

Segment 3. Cougar dam base developments downstream to confluence with main Mckenzie River (approximately 4.5 miles).

Potential for Designation:

From the headwaters down to Cougar Reservoir, segments 1 and 2, and base facilities of Cougar Dam to confluence with main Mckenzie River (segment 3), approximately 25.7 miles.

River Mileage:

Study:	- 25.7 miles
Eligible:	- 0.0 miles
Draft Forest Plan:	- 0.0 miles

Outstandingly Remarkable Values:

The outstandingly remarkable values associated with the Mckenzie River are excellent fishery, spectacular scenery, and significant recreational opportunities to appeal to the full range of forest visitors.

The outstanding scenery coupled with the proximity to Eugene/Springfield makes it an important recreational area in the Mckenzie Valley. Fully developed campgrounds and dispersed sites are distributed along it's entire length. In conjunction with these sites are a number of major trail heads providing access to the Three Sisters Wilderness, roadless areas and general forest trails.

Another significant feature of the river is the Aufderheide Drive, a National Scenic Byway. This is a two-lane, paved surface which parallels the river, providing easy access. The Aufderheide Drive is part of a 145 mile scenic loop from the Eugene-Springfield metropolitan area.

Under the Draft EIS and Forest Plan, a companion trail system is proposed along the entire length continuing along the North Fork of the Middle Fork Willamette River, also being considered a candidate for Federal Wild and Scenic River.

Potential Classification:

Segment 1	Wild	5.2 miles
Segment 2	Recreational	16.0 miles
Segment 3	Recreational	4.5 miles

Landownership:	**River Miles**	**Corridor Acres**
Willamette National Forest	25.2	8,064
Private	0.5	160
Total	**25.7 Miles**	**8,224 Acres**

Mineral and Energy Resource Activity:

There are no known mining claims within the corridor of the river. No interest has been expressed in mineral exploration or development, and the lands within the corridor have low mineral potential, making entry unlikely.

There are no geothermal leases in the area with low potential for any geothermal development. There is one geothermal area, Terwilliger Hot Springs also known as Cougar Hotsprings which has been identified as a Significant Interest Area (SIA) in the DEIS. There are no oil or gas leases within the corridor and the potential for exploration and development is low.

Water Resource Developments:

Segment 1 is located totally within the Three Sisters Wilderness; therefore, no impoundments or potential water resource developments. There are no existing impoundments nor potential water resource development sites located within segment 2. Segment 3 starts from the base of Cougar Dam under the administration of the Army Corps of Engineers. A generator facility is located at the base of the dam and is visible from the uppermost section of the river along with past dam construction activity. Further downstream a side channel was reopened for development of anadromous fish habitat. The proposed Strube Regulatory dam site lies along this stream segment.

Transportation, Facilities, and Other Developments:

- Forest Development Road 19 is a paved, two-lane road which parallels the river for most of its length in segment 2 and 3, providing easy access to the river. Forest Road 19 was recently designated a National Scenic Byway as Aufderheide Drive. In some areas the road is visible from the river.

- There are bridges scattered along the river in segments 2 and 3. One bridge in segment 3, and 4 bridges in segment 2. Two of the bridges in segment 2 provide access for major arterial forest roads, Forest Road 19-1980 and 19-1927.

- There are bridges scattered along the river in segments 2 and 3. One bridge in segment 3, and 4 bridges in segment 2. Two of the bridges in segment 2 provide access for major arterial forest roads, Forest Road 19-1980 and 19-1927.

- In addition to Cougar Dam and its power generation facilities which are visible from the upper section of the river, a high tension power line crosses the river in segment 1.

- Timber harvest activities have taken place along the corridor and in a few locations are somewhat visible from the river.

- Forest Service recreation developments include 3 campgrounds and a number of dispersed recreation sites scattered along segments 2 and 3.

- In some locations low standard timber access roads in the corridor provide access to timber management areas.

Recreation Activities:

The South Fork Mckenzie River, as a whole, has very high recreational values. A major population center lives within a 1 hour drive of the river. Recreational use on segments 2 and 3 is predominantly camping, fishing, and hiking. A number
of trailheads providing wilderness access are located within the corridor.

Segment 3 is all within the Three Sisters Wilderness and provides great scenic values of numerous cascading falls and white water. Wilderness trails are around the headwaters with excellent fishing from glacial lakes.

Segments 2 and 3 provide a variety of developed and dispersed recreational opportunities. User density in some areas is very high, with equal amounts of day users and overnight users. Fishing is second only to camping and viewing scenery in terms of popularity.

Recreation Activities (Estimated Recreational Visitor Days - RVD's)

Activity	**1989**	**2000**
Fishing	4,000	5,000
Camping	10,000	20,000
Picnicking	5,000	8,000
Hiking	3,000	6,000
Viewing Scenery	50,000	75,000
Car Touring	50,000	75,000
Total	**122,000**	**189,000**

Wildlife and Fisheries:

Important high use big game winter range (deer and elk) and a critical winter travel corridor along river in segment 2. The river flows through the South Fork Old Growth Corridor, Special Interest Area (SIA) and flows by mature old growth Douglas-fir along the majority of the stream corridor. The

Delta Old Growth Grove is located in segment 3. The stream corridor crosses old growth habitat suitable for 2 spotted owl nest areas and 3 foraging areas; 1 osprey nest site, and 1 nearby pileated woodpecker nest area. In segment 3 are nearby ponds and backwaters, with some waterfowl and beaver activity.

Upper sections are stocked with rainbow trout by ODFW. Abundant native cutthroat trout are found in the upper portions of the stream. Spring chinook salmon and steelhead runs are present in segment 3 up to Cougar Dam.

Streamflow:

The river is considered to be of high quality and free from manmade pollutants. Even during periods of heavy rainfall, sedimentation is not a major problem.

Segment 1 has very high water quality. It is fed by snowmelt from the Cascades via porous lava beds, resulting in sustained flows throughout the summer and fall months. Segment 2 is fed by rain and snowmelt. Sustained flow throughout the year with flows averaging 1000-1500 cfs and summer/fall flows averaging 235 cfs.

Segment 3 is regulated by Cougar Dam with mean annual flow of 820 cfs. Winter flood release may be as high as 1600 cfs while summer flows vary from 300 to 800 cfs.

Geology:

The headwaters originate over gentle lava flows that have been glaciated, leaving many glacial lakes. Below the headwaters, the stream flows through a very narrow, steep, rugged canyon that is 4 miles long and 1200 feet high. The canyon is forested, with large rock bluffs and cliffs of andesite/basalt. Wider floodplain/valley walls are found in the upper section near the confluence with Roaring River. As the river flows downstream it turns into a wide meandering river channel, with alluvial and glacial deposits.

Cultural Resources:

The entire study corridor has a high percentage of prehistoric cultural use. Identified are 11 archeological sites (prehistoric); 12 isolated artifacts; and 2 historic sites (1 campsite, 1 corral). In recent historic times (late 14th - early 20th), the South Fork Mckenzie was an aboriginal travel route used by Indians on horseback, who travelled from the east side of the Cascades to hunt big game and gather berries. More ancient artifacts indicate much earlier occupations and resource exploitation by native hunters but it is unknown whether they were year round residents. In later times the South Fork Mckenzie was a historic travel access for mining exploration and stock raising (sheep).

Timber:

The portion of the river corridor that is eligible for Recreation River designation includes about 3,840 acres. Stands of mature/old growth Douglas fir, and western hemlock occupy the area. Estimated ASQ without river designation is 0.0 MMBF considering proposed management of the corridor in the Draft Forest Plan. The ASQ of the corridor, if designated as a Recreation River, is also estimated to be 0.0 MMBF in consideration of proposed management for this area in the Draft Forest Plan.

Socio-Economic Effects:

The South Fork Mckenzie River is close to the Eugene/Springfield metropolitan area. The local economy is dependent on both timber industry and tourism.

Designation as a Wild and Scenic River along with the newly designated Scenic Byway route would increase recreational use due to enhanced area recognition.

Current management and the preferred alternative restrict timber harvest in the corridor. Designation as a Wild and Scenic River would have no effect on timber harvest in comparison to the Draft Forest Plan.

Current Administration:

The study segment of the river is currently managed by the Willamette National Forest along the majority of its length except for a small area of private land
located in segment 3.

Funding Needs If Classified as a Wild and Scenic River:

The following are expected funding requirements for the South Fork Mckenzie for the next 5 years:

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expenses Expected With Designation**
General Administration	$ 15,000	$ 8,000
Costs of Implementation		10,000
Development of Management Plan		130,000
Development Costs	50,000	
Operation and Maintenance	35,000	5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance costs are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

The DEIS and Draft Forest Plan did not recommend designation of any of the segments as a Recreationa River under the Wild and Scenic Rivers Act. The Draft Forest Plan recommends a Special Interest Area (SIA) designation along the river corridor, 1/8 mile wide on either side of the river for segment 2. Segment 3 is designated as "Scenic - Retention Foreground". Segment 1 is included in Wilderness.

LITTLE NORTH FORK of the SANTIAM RIVER

Potential Wild and Scenic River

State of Oregon Willamette National Forest Marion County

The Little North Santiam River has been studied for potential Wild and Scenic River designation. It was identified for review through public input to the Willamette National Forest DEIS and Draft Forest Plan. These were issued for public review in December 1987.

Location:

From the headwaters at the confluence of Battle Axe and Opal Creeks in T. 8 S., R.5 E., Section 28, SW 1/4 (Willamette National Forest) to the Forest boundary near the community of Elkhorn in T.8 S., R.4 E., Section 32, NE 1/4 (Willamette National Forest).

Eligible for designation:

From the confluence of Battle Axe Creek and Opal Creek to the Forest boundary, (7.8 river miles).

Outstandingly remarkable values:

The outstanding scenery and essentially undisturbed nature of the Little North Santiam River canyon combined with the proximity to Salem and other Willamette Valley communities make it a very popular area for dispersed recreation. The river is classified as a Scenic Waterway by the State of Oregon.

The Little North Santiam River is visually dramatic. It flows through dense virgin stands of old-growth Douglas-fir, western redcedar and western hemlock as well as younger stands of these species. The canyon walls are often deeply cut and steep walled. Rock outcrops are common and spectacular - vertical banks over 300 hundred feet high can be found. The riverbed in many areas consists of sculptured bedrock which creates many clear pools, rapids and waterfalls that drop as much as thirty feet.

The Little North Santiam Canyon is one of the few historic mining districts in western Oregon. Scattered remains of historic mining activity are present; however, few are visible from the river. The area is popular with "recreational miners" who pan for gold in and near Shady Cove Campground.

River Mileage:

Study:	7.8 miles
Eligible:	7.8 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Entire segment - Scenic

Landownership:	**River Miles**	**Corridor Acres**
Willamette National Forest	7.8 miles	2621 acres

Private Land	0.0	5 acres
Total	7.8 miles	2626 acres

Mineral and Energy Resource Activities:

Early day prospecting and mining activity is evident throughout the Little North Santiam Canyon; however, nearly all claims that had significant development are located outside the corridor. There is a mining camp and millsite known as Jawbone Flats within the 1/4 mile wide corridor near the headwaters at the confluence of Battle Axe and Opal Creeks. The one active claim associated with the millsite is located outside of the corridor. There are many staked locations for mining claims in the river corridor. None of these claims have had any significant mining activity in the recent past other than panning or occasional small dredge operation. The lands within the corridor have relatively low mineral potential, making anything other than recreational prospecting unlikely. There is one mining claim in the corridor which is currently involved in a patent contest. Pending a decision, the claim will either become private land or be declared null and void.

There are no known geothermal resource areas in the Little North Santiam Canyon.

Water Resource Developments:

There are no existing impoundments nor potential water resource development sites within the proposed study area.

Transportation, Facilities and Other Developments:

Forest Service road 2209 and 2207 generally follow the river allowing good access in some areas and more difficult in others. These roads are rarely visible from the river. Road 2207 crosses the river with a wooden truss bridge with a concrete span at Shady Cove Campground. There is a mining access spur with a log stringer bridge that crosses the river several miles upstream of Shady Cove.

There are no developed recreation facilities in the river corridor. Shady Cove Campground is considered a dispersed site.

The Little North Santiam trail follows the river from the Forest Boundary to Shady Cove Campground. Planning is in progress to extend this trail from Shady Cove Campground to the confluence of Battle Axe and Opal Creek.

A mining camp, known as Jawbone Flats, which consists of approximately fifteen rustic cabins and buildings is located at the confluence of Battle Axe and Opal Creeks.

Recreation Activities:

A number of dispersed recreational opportunities exist within the river corridor. Heaviest use is from Shady Cove Campground to the Forest boundary. This lower stretch of the river is popular for camping, fishing, hiking, tubing, swimming and sunbathing. Many heavily used dispersed sites exist along this stretch of the river.

The area from the confluence with Gold Creek up to the headwaters is very popular for hiking and sightseeing, and to a lesser degree, fishing and photography. Currently there is no trail along the river; however, current plans will extend the trail from Shady Cove along the full length of the river to tie

with the proposed Opal Creek Trail (a popular hiking route). Road 2209 is rather primitive and closed to public vehicles east of a locked gate near Gold Creek. This road winds through old-growth groves and has spectacular views of the river.

Recreational gold panning is common from Shady Cove Campground to the Forest boundary.

This area has a long season of use due to its low elevation and easy access from Salem (40 miles).

Wildlife and Fisheries:

A sensitive wildlife species known to inhabit the river drainage is the northern spotted owl. Other species known to frequent the river are deer, waterfowl, cavity nesting birds and numerous species of small birds and mammals.

The river has resident native cutthroat trout, eastern brook trout and anadromous species. Steelhead are the principal anadromous fish. Legal size trout are occasionally stocked by Oregon Department of Fish and Wildlife at the Shady Cove bridge.

Streamflow:

Streamflows are adequate to maintain a fishery and recreation opportunities year-round. The river water is extremely pure with exceptional clarity, low organic content and low levels of aquatic life. The river runs very clear all year.

Geology:

The river flows through predominantly volcanically derived rock of the Western Cascade Sequence. Unlike other Cascade areas, flow lavas predominate over fragmental rocks. This accounts for the large number of rock outcrops, cliffs and gorges that occur along the river. The river bed is often bedrock. Several dioritic intrusive bodies, which are relatively rare in the Cascades, exist in this area. These intrusive formations are typically dacite porphyries containing veins of chalcopyrite, pyrite, and complex sulfides.

Botany:

The forests along the river are predominantly dense stands of Douglas-fir, western hemlock and western redcedar. The stands on the lower reaches of the river are typically younger, naturally regenerated after relatively recent fires (about 60 years old), whereas the upper reaches are primarily old-growth. Hardwood species such as red alder, bigleaf maple and cottonwood occur near the river on the lower half of the segment. Significant understory species include vine maple, dwarf Oregon-grape, salal, twinflower, sword-fern, red huckleberry and bracken-fern. No sensitive plant species are known to be present.

Cultural Resources:

Evidence of prehistoric Indian activity is evidenced by lithic scatters found near the river below Shady Cove Campground, as well as other locations within the corridor. Early day prospecting/mining activity is evident throughout the area. Placer and lode claims still exist, but are inactive except for recreational panning.

Timber:

The portion of the river corridor that is eligible for Scenic River designation includes about 2,626 acres. Stands of native old growth Douglas fir, western hemlock and western red cedar occupy the area. Estimated ASQ without designation is approximately 0.8 MMBF and 0.7 MMBF if the area were designated as a Scenic River.

Livestock Grazing:

There are no grazing allotments within the river corridor.

Socio-Economic Effects:

The Little North Santiam River corridor under consideration begins about 37 miles from Salem and 15 miles from the towns of Lyons/Mehama. The local economy is largely dependent on the timber industry, along with an increasing tourism industry.

Designation of the river would most likely increase the number of people visiting the area. This increase in number of recreation visitors would benefit the tourism related businesses in the local area.

Current management direction and the preferred alternative in the 1987 Draft PLAN restrict timber harvest in the corridor. Designation as a Wild and Scenic River would have little effect on timber harvest level relative to the preferred alternative.

Current Administration:

The entire corridor, with the exception of 5 acres of private land, is administred by the Willamette National Forest, Detroit Ranger District.

Funding Needs If Classified as a Wild and Scenic River:

The following are expected funding requirements for the Little North Santiam River for the next five years.

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expense Expected with Designation**
General Administration	$15,000	$8,000
Implementation		$10,000
Development of Management Plan		$130,000
Development Costs	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

This river was not studied or considered for Wild and Scenic River classification in the Draft EIS and Draft Forest Plan. The outstandingly remarkable values and characteristics of the 7.8 mile stretch of the Little North Santiam River will, however, be protected in the Current Forest Plan, and in the Proposed Forest Plan when implemented, until a determination of suitability is made with regard to the river's potential inclusion the National Wild and Scenic River system.

BATTLE AXE CREEK

Potential Wild and Scenic River

State of Oregon Willamette National Forest Marion County

Battle Axe Creek has been studied for potential Wild and Scenic River designation. It was identified for review through public input to the Willamette National Forest DEIS and Draft Forest Plan. These were issued for review in December 1987.

Location:

From the headwaters of Battle Axe Creek in Section 1, T.9S., R.5E. in Bull of the Woods Wilderness to its confluence with Opal Creek in the SW 1/4 of Section 28, T.8S., R.5E., W.M. (5.0 miles).

Eligible for Designation:

Battle Axe Creek was found to be not-eligible for inclusion in the Wild and Scenic River System.

Outstandingly Remarkable Values:

The stream was reviewed and evaluated by an interdisciplinary team in 1989. Several attributes of the stream including scenic, recreational, geologic, fish, wildlife, historical/cultural and ecological qualities were reviewed. No attributes or features of Battle Axe Creek were identified which had a significance level of "outstandingly remarkable." This qualification is required, as a minimum, to establish eligibility for further consideration as a potential Wild and Scenic River.

River Mileages:

Study:	5.0 miles
Eligible:	0.0 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Not applicable.

Land Ownership:	River Miles:	Corridor acres:
Willamette National Forest	5.0	1,727

Mineral and Energy Resource Activity:

Early-day mining activity is evident along the lower two miles of the corridor. Some claims within the corridor had significant development. Approximately 30 existing mineral claims are within the corridor including 3 millsites at the confluence of Battle Axe and Opal Creeks. Mining related activity has occurred recently on some claims. Three claims and the millsites are presently involved in a patent contest. After a decision, the claims and millsite will become private land or be declared null and void and remain public land. There is no known geothermal potential in Battle Axe Creek corridor.

Water Resource Developments:

There are no existing or planned impoundments or diversions within the corridor.

Transportation, Facilities and Other Developments:

Access to the west end of the corridor at Jawbone Flats millsite is via Forest Road #2209. The last three miles of the road are not open for vehicular use by the public. This limits public access to foot, horse or bicycle travel to reach the corridor.

The east end of the corridor is accessed from Breitenbush Road #46 via Forest Road #4697. The last few miles of the road is extremely rough and not passable by low clearance vehicles. At one time, the road connected to Forest Road #2209 at the mining area. It now ends at Beachie Saddle, on the ridge dividing the Little North Santiam and Breitenbush River drainages. This is the boundary of Bull of the Woods Wilderness.

A primitive mining road parallels the creek its entire length. It is drivable by high clearance vehicles for approximately two miles upstream from the confluence. The last four miles of the road are now within Bull of the Woods Wilderness and have been allowed to deteriorate. This segment is managed as Battle Axe Creek Trail #3339. The trail connects to Forest Road #4697 at Beachie Saddle. The road and trail are not generally visible from the creek.

Whetstone Mountain Trail #3369 leaves from the former road just inside the wilderness boundary. It quickly crosses Battle Axe Creek and then climbs steeply away from the creek. It is within the corridor for approximately one-half mile.

There has been no timber harvest or other management activities in the corridor.

The lower two miles of Battle Axe Creek serves as the southern boundary of Bull of the Woods Wilderness. The upper reaches of the creek are entirely within the wilderness.

Recreation Activities:

Historically, recreation activity within the corridor has been relatively light. However, it has grown in recent years and some growth is expected to continue in the future. Principal activities are hiking on existing trails and sightseeing. The stream is not navigable and it does not support a significant recreational fishery.

Wildlife and Fisheries:

The general area supports wildlife species indigenous to the western Cascades, except elk. No listed species are known to be present and there are no special habitat areas in the corridor. The stream supports a native population of small cutthroat trout. No fish stocking is done.

Streamflow:

The creek has perennial flow its entire length. Its water is free of pollutants and has exceptional clarity. It has low organic content and low levels of aquatic life. Discoloration does occur during periods of high run-off.

Geology:

The corridor is in volcanically derived and glaciated landforms typical of the western Cascades Sequence. The stream bed is often of bedrock. Dioritic intrusive bodies are present in the area. The formations are typically dacite porphyries containing veins of chalcopyrite, pyrite and complex sulfides.

Botany:

The corridor is forested with Douglas-fir/western hemlock and Pacific silver fir associations common to the western Cascades. Forest stands in the lower portion of the corridor are represented by mature and old growth stages. Forest stages in the upper reaches, in the vicinity of Beachie Saddle, are pole and small saw timber. These young stands are a result of natural fire occurrence late in the last century.

Cultural Resources:

Evidence of early mining activity including abandoned roads, adits and deteriorated structures are present along the lower reaches. The millsite at the confluence is still using some structures which are of historic age. The corridor has not been intensively surveyed for evidence of prehistoric use. Lithic scatters have been located in the vicinity of the millsite.

Timber:

Most of the corridor is within Bull of the Woods Wilderness. The proposed allocations for the the portion outside of wilderness have Visual Quality Objectives of Partial Retention-Foreground and Retention-Foreground. These allocations have timber yields of 7% and 5%, respectively. The total acreage within these allocations is relatively small.

Livestock Grazing:

There are no grazing allotments within the corridor.

Socio-Economic Effects:

Battle Axe Creek is approximately 50 miles from Salem, the nearest metropolitan area in the Willamette Valley. The local economy is largely dependent on the timber industry. Designation of the stream would most likely increase the number of recreation visits to some degree. This increase would benefit tourism related businesses serving the North Santiam area.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Detroit Ranger District.

Funding Needed if Classified as a Wild and Scenic River:

Not applicable.

Forest Plan Alternatives:

Battle Axe Creek was not considered for Wild and Scenic classification in the DEIS and Draft Forest Plan.

OPAL CREEK

Potential Wild and Scenic River

State of Oregon Willamette National Forest Marion County

Opal Creek has been studied for potential Wild and Scenic River designation. It was identified for review through public input to the Willamette National Forest DEIS and Draft Forest Plan. These were issued for review in December, 1987.

In 1987, the Oregon State Legislature directed that Opal Creek be reviewed for inclusion in the Oregon State Scenic Waterway System. The decision of the reviewing body was that the creek did not meet state criteria for inclusion.

Location:

From the headwaters at Opal Lake in Section 17, T.9S., R.5E. to its confluence with Battle Axe Creek in the SW 1/4 of Section 28, T.8S., R.5E., W.M. near the Jawbone Flats mining millsite. (4.0 miles)

Eligible for Designation:

Opal Creek was found to be not-eligible for inclusion in the Wild and Scenic River System.

Outstandingly Remarkable Values:

The stream was reviewed and evaluated by an interdisciplinary team in 1989. Several attributes of the stream including scenic, recreational, geologic, fish, wildlife, historical/cultural and ecological qualities were reviewed. No attributes or features of Opal Creek were identified which had a significance level of "outstandingly remarkable." This qualification is required, as a minimum, to establish eligibility for further consideration as a potential Wild and Scenic River.

River Mileages:

Study:	4.0 miles
Eligible:	0.0 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Not applicable.

Land Ownership:	River Miles:	Corridor Acres:
Willamette National Forest	4.0	1,493

Mineral and Energy Resource Activity:

Early day mining activity is evident along the lower mile of the corridor. Approximately four existing claims re within the corridor, however, none have had significant development. Three millsite claims are located at the confluence of Opal and Battle Axe Creeks. The most prominent millsite, known as Jawbone Flats, has about sixteen buildings including office, bunkhouses, repair shops and a small concentrating mill. The Millsites are presently involved in a patent contest. After a final decision is made, the millsites will become private property or be declared null and void and remain as public land. There is no known geothermal potential in the vicinity of Opal Creek.

Water Resource Developments:

An eight inch pipe diverts water for domestic use and power generation from a small tributary of Opal Creek at 0.6 mile. The overflow from a settling pond at the concentrating mill drains into Opal Creek just upstream of its mouth. No channel work or impoundment exists or is planned in the creek.

Transportation, Facilities and Other Developments:

Access to the north end of the corridor at the mouth of Opal Creek is via Forest Road #2209. The last three miles of this road beyond Gold Creek is not open for vehicular use by the public. This limits public access to foot, horse or bicycle travel to reach the corridor. Opal Lake at the south end of the corridor is reached via Forest Road #2207 and a short trail which ends at the lake.

There are no existing system roads or trails within the corridor. An unauthorized "user" trail has been constructed from the mining camp water intake for approximately one and a half miles along the east side of the creek. This trail is very primitive and does not meet standards for location, grade or surfacing. It will need some rehabilitation work to prevent adverse impact on Opal Creek. A system trail running the length of the corridor is proposed but has not yet been funded.

A proposed timber sale road has been surveyed and located on the ground but not constructed. This route enters the corridor about midway from the mouth and Opal Lake. It would cross the creek once. Visitors sometimes use the "P-line" of the road location as a trail to access the interior of the corridor.

Timber was harvested early in this century in the vicinity Jawbone Flats for lumber and mine timbers. Timber was harvested near Opal Lake in the late 1950's. Both of these areas are reforested. No timber has been harvested within the central portion of the corridor. However, two timber sales are presently planned but not sold.

Recreation Activities:

Principal attraction of the Opal Creek area is enjoyment of the scenery. Opal Creek is very picturesque amid an old growth timber setting. Interest in the mining area around Jawbone Flats is also an attraction.

Historically, recreation use has been relatively light due to difficulty of access. The recent controversy over management of the Little North Santiam drainage, with its focus on Opal Creek, has resulted in a significant increase in visitation. Continued growth is expected in the future. Nearly all use is day

oriented hiking, sightseeing and general enjoyment of the outdoor environment. Opal Creek is not navigable and does not support a significant recreational fishery.

Wildlife and Fisheries:

The area supports wildlife species indigenous to the western Cascades, except elk. No listed species are known to be present, although a sighting of the northern spotted owl has been reported. Its presence has not been confirmed. A pileated woodpecker management area is proposed in the lower portion of the corridor.

The creek has a small population of rainbow trout. Easter brook trout were planted in Opal Lake several years ago and have migrated down stream. A 1976 stream survey estimated about one legal-size fish per 100 yards of stream length. Anadromous species are not present due to an impassable falls on the Little North Santiam River. No stocking of fish is done in Opal Creek.

Streamflow:

Opal Creek is a perennial stream its entire length. Its volume is highly variable and largely precipitation dependent. Flows range from a high of over 200 cubic feet per second to less then five. Its water is free of pollutants and has exceptional clarity due to low organic content and little aquatic life. Discoloration does occur during periods of high runoff.

Geology:

The corridor has volcanically derived and glaciated landforms typical of the Western Cascades Sequence. The creek flows through a stable bedrock channel with little evidence of natural instability. The stream varies from 200 foot waterfalls below Opal Lake, to a meandering low gradient stream in a vine maple thicket, to a series of cascades in a bedrock chute with no riparian vegetation. Opal Creek has an average of three 10-20 foot waterfalls per mile of stream. Visibility from the stream channel is generally limited by the bedrock stream channel and dense understory vegetation.

Botany:

Opal Creek is within Douglas-fir/western hemlock and Pacific silver fir plant associations. The forest stand are primarily in the mature and old growth stages.

Cultural Resources:

Historic use has been limited to the lower reaches near the mining area. Jawbone Flats was inventoried and considered for listing on the National Register of Historic Places, but was determined to be ineligible. Large lithic scatters have been found in the vicinity of the confluence, however, artifact evaluation has not been conducted. The remainder of the corridor has not been intensively surveyed for cultural materials.

Timber:

Proposed management allocations within the Opal Creek corridor include no-harvest allocations of Special Habitat (lakeside) in the vicinity of Opal Lake and Special Interest Area from the mouth of Beachie Creek, downstream to the mouth of Opal Creek. These are connected by a scenic corridor of Scenic Foreground-Retention which has a 5% harvest rate. The periphery of the potential wild and scenic corridor is proposed General Forest with full timber yield.

Livestock Grazing:

There are no grazing allotments within the corridor.

Socioeconomic Effects:

Opal Creek is located approximately 50 miles from Salem, the nearest metropolitan area in the Willamette Valley. The local economy is largely dependent on the timber industry. Designation of the stream would most likely increase the number of recreation visits to some degree. This increase would benefit tourism related businesses serving the North Santiam area.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Detroit Ranger District.

Funding Needed if Classified as a Wild and Scenic River:

Not applicable.

Forest Plan Alternatives:

Opal Creek was not considered for designation as a Wild and Scenic River in the DEIS and Draft Forest Plan.

NORTH FORK BREITENBUSH RIVER

Potential Wild and Scenic River

State of Oregon Willamette and Mt. Hood National Forests Marion County

The North Fork Breitenbush River, including the South Fork of the North Fork Breitenbush, has been studied for Wild and Scenic River designation. It was identified for review through public input to the Willamette National Forest DEIS Draft Forest Plan. These were issued for review in December, 1987.

Location:

From the headwaters of the South Fork of the North Fork Breitenbush in Section 3, T.10S., R.8E. to the confluence of the North Fork Breitenbush and South Fork Breitenbush Rivers in Section 21, T.9S., R.7E., W.M.

Segment 1	The South Fork of the North Fork Breitenbush and North Fork Breitenbush within Mt. Jefferson Wilderness. (6.6 miles)
Segment 2	The North Fork Breitenbush downstream from the Mt. Jefferson Wilderness boundary. (6.0 miles)

Eligible for Designation:

Both segments were found to be not-eligible for inclusion in the Wild and Scenic River system.

Outstandingly Remarkable Values:

The stream was reviewed and evaluated by an interdisciplinary team in 1989. Several attributes of the stream including scenic, recreational, geologic, fish/wildlife, historical/cultural and ecological qualities were reviewed. No attributes or features were identified which had a significance level of "outstandingly remarkable." This qualification is required, as a minimum, to establish eligibility for further consideration as a potential Wild and Scenic River.

River Mileages:

Study:	12.6 miles
Eligible:	0.0 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Not applicable.

Land Ownership:	River Miles:	Corridor Acres:
Willamette and Mt. Hood National Forests	12.6	3,705

Mineral and Energy Resource Activity:

Portions of Segment 2 are within a Known Geothermal Resource Area (KGRA) associated with Breitenbush Hot Springs, which is just downstream of the river corridor. This suggests a high potential for geothermal development. Preliminary exploration leases were awarded within the corridor in 1976. Several companies performed various exploration procedures in the corridor and throughout the adjacent KGRA lands. None of the companies chose to continue with further development of geothermal development. There are no known mineral claims within the corridor. The area has low potential for locatable minerals.

Water Resource Development:

There are no existing or planned dams or diversions of either segment.

Transportation, Facilities and Other Developments:

Segment 1 is entirely within Mt. Jefferson Wilderness. There are no trails or developments of any type in the corridor.

Segment 2 is paralleled by Breitenbush Road #46 on the north side and local road #4685-302 on the south side. Both roads are only occasionally visible from the river. Forest Road #4685 crosses the river via concrete bridge approximately one mile above the confluence. Local road #46-015 accesses Flagstone rock pit which is within the corridor in section 13.

Timber harvest activities have occurred throughout the corridor including extensive salvage and clear-cut units. These activities are readily evident from the river. Past timber salvage practices removed all blown down timber and stumps from the river channel. This resulted in increased widening during high water. This activity was discontinued several years ago and woody debris is again accumulating in the river. Some stream channelization has been done to protect the bridge on road #4685.

A high voltage transmission line managed by Bonneville Power Administration is located along the northern edge on the corridor.

Recreation Activities:

Segment 1 receives very little recreational use due to its inaccessibility. Activities in Segment 2 include recreational driving, dispersed camping, fishing and hunting.

Wildlife and Fisheries:

Segment 1 of the corridor is mainly summer range for deer and elk. Black bear are also present. Segment 2 of the corridor is winter range and is heavily used by elk. The lower portion of Segment 2 is within a Spotted Owl Habitat Area. Both segments of the corridor have a resident population of rainbow trout. Oregon Department of Fish and Wildlife stock legal-size trout below the bridge on road #4685 throughout the summer.

Streamflow:

Both segments have perennial flow. The water is free of pollutants and very high in quality. It is generally very clear with short periods of discoloration during high runoff.

Geology:

The general area is characterized by volcanically derived and glaciated landforms typical of the western Cascades. In Segment 1 the river is confined within a narrow, steep sided canyon. Numerous waterfalls, cataracts and rapids are present. In Segment 2 the river enters a broad valley bottom of glacial outwash. The channel widens and is occasionally braided. Although it maintains a rapid flow, it is too shallow to float. Few pools are present.

Botany:

The river begins in sub-alpine meadows and bogs. It passes through mountain hemlock/lodgepole pine associations and enters Douglas-fir/western hemlock forest types in the valley. No presently listed threatened or endangered species are known to be present.

Cultural Resources:

It is known that early Americans visited the area as evidenced by lithic scatters found in Segment 2. It is likely that this area was heavily used due to the nearness of Breitenbush Hot Springs. Also, the river supported runs of anadromous fish prior to the construction of Detroit Dam. Fish traps were in use in the vicinity of the hot springs during historic time.

Timber:

The corridor of Segment 1 is wholly within Mt. Jefferson Wilderness. Proposed land management allocations in Segment 2 include Scenic-foreground with a Visual Quality Objective (VQO) of Retention and Scenic-middlegroung with a VQO of Partial Retention. These management areas have timber harvest rates of 7% and 10%, respectively, per decade.

Livestock Grazing:

There are no grazing allotments within the corridor.

Socioeconomic Effects:

The North Fork Breitenbush River is within a two hour driving time of several major cities, including Bend, Eugene, Salem and Portland. Detroit Reservoir, a large state park, several National Forest campgrounds and a private resort are principal recreational attractions within a few miles of the river. The local economy is dependent on timber, although tourism is significant and growing. Community and business associations are actively working to diversify the economy. Designation would likely increase the numbers of visitors to the area, benefitting tourism related businesses.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Detroit Ranger District.

Funding Needed if Classified as a Wild and Scenic River:

Not applicable.

Forest Plan Alternatives:

The North Fork Breitenbush River was not considered for Wild and Scenic River classification in the DEIS alternatives or the Draft Forest Plan.

SOUTH FORK of The BREITENBUSH RIVER

Potential Wild and Scenic River

State of Oregon Willamette National Forest Marion County

The South Fork of the Breitenbush River has been studied for potential Wild and Scenic River designation. It was identified for review through public input to the Willamette National Forest DEIS and Draft Forest Plan. These were issued for review in December, 1987.

Location:

From the headwaters at Russell Lake in the SW 1/4 of Section 11, T.10S., R.8E. in Mount Jefferson Wilderness to its confluence with the North Fork of the Breitenbush River in the NW 1/4 of Section 21, T.9S., R.7 E., W.M.

Segment 1. Russell Lake to the Wilderness Boundary (4.0 miles).

Segment 2. Wilderness boundary to it's confluence with the Breitenbush River (6.5 Miles).

Eligible for Designation:

Segments 1 and 2.

Outstandingly Remarkable Values:

Scenic quality is the most outstandingly remarkable feature of the South Breitenbush River. Its clear waters travel from sub-alpine meadows to mature forest vegetation zones. Scenic variety includes cascades and falls as the river enters a steep walled canyon, emerging as a fast flowing stream through a shady "park-like" setting.

Other distinctive features include a geologic formation which constricts the river through a very narrow gorge for a few hundred feet, and an attractive biological surrounding. The corridor is recognized for its "old growth" Douglas fir/western hemlock forest type and as habitat for the northern spotted owl. Outside of wilderness, the river is easily accessible via the South Breitenbush Gorge National Recreation Trail, which parallels the river for 2 1/2 miles.

River Mileages:

Study:	10.5 miles
Eligible:	10.5 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Segment 1	Wild	4.0 miles

Segment 2	Scenic	6.5 miles
Land Ownership:	**River Miles:**	**Corridor Acres:**
Willamette National Forest	10.5	3,583

Mineral and Energy Resource Activity:

There are no known mineral claims within the corridor. The area has low potential for locatable minerals. However, portions of Segment 2 are within a Known Geothermal Resource Area (KGRA) associated with Breitenbush Hot Springs. This suggests high potential for geothermal development. Preliminary exploration leases were awarded within the corridor in 1978. A company performed various exploration procedures but did not choose to pursue development. Other companies performed similar work throughout the KGRA, also without further development of geothermal resources.

Water Resource Developments:

There are no existing or planned dams or diversions on either segment. No channelization or bank stabilization work has been done.

Transportation, Facilities and Other Developments:

Segment 1 is entirely within Mt. Jefferson Wilderness. It is crossed by one trail ford approximately 1/4 mile below its source. The trail immediately leaves the river after crossing. No other trail segments or other improvements are within the corridor of this segment.

Segment 2 has several improvements within its corridor. It is paralleled by Forest Road #4685, a gravel surfaced route, on the north side. The road is not visible from the river. Local Road #4685-200 crossed the river with a concrete bridge and parallels the river for 1/2 mile. It is partially visible from the river, but has very limited use. An additional 1/2 mile of road is presently proposed within the corridor.

The South Breitenbush Gorge National Recreation Trail (NRT) #3366 follows the river for 2 1/2 miles. The trail is not generally visible from the river, but sight and sounds of the river is a key factor in the enjoyment of the trail. There are plans to extend the NRT approximately three miles by reopening an abandoned section of the trail to the east of the current NRT. A second trail crosses Segment 2 just outside the wilderness, near Crag Creek, using a log jam. It approaches and leaves the river quickly, with less than 1/4 mile of the trail being in sight of the river.

Timber management activities have occurred within the corridor which include shelterwood cutting, small clearcuts and mortality salvage. Although partially visible from the river, evidence of these activities is subdued and not readily evident to visitors travelling the river and the National Recreation Trail.

Recreation Activities:

Principal recreation activities are hiking, dispersed camping, nature study and general enjoyment of nature. Breitenbush Gorge, a narrow fissure in a basalt dike which narrows the river to a width of five feet, is a major attraction on the river. Other key attractions to the area are the National Recreation Trail and large "old growth" Douglas fir timber. An existing designated Old Growth Grove spans the river from below the "gorge" to the near the confluence. Other recreational activities include fishing and hunting.

Wildlife and Fisheries:

Segment 1 of the corridor is summer range for elk. Black bear are also present in this area. Segment 2 of the dorridor is also winter range and is heavily used by elk in winter and spring. Approximately three miles of the corridor below Roaring Creek is a Spotted Owl Habitat Area. Resident cutthroat trout and eastern brook are present although not in large number or size. No stocking of legal size fish is done.

Streamflow:

The river flows year around its entire length. Its water is free of pollutants and is very high in quality. Short periods of discoloration sometimes occur during heavy winter storms as a result of natural bank sloughing at a point within the wilderness.

Geology:

The river begins as an outlet to Russell Lake in a sub-alpine "hanging valley" at the crest of the Cascades. It soon looses elevation rapidly with a series of falls and cascades, entering a steep-sided canyon. The gradient drops near the wilderness boundary as the stream enters a narrow alluvial valley bottom. A notable attraction is Breitenbush Gorge where the river has eroded through a basalt dike. At this point, the river is constricted by a rock walled channel as narrow as five feet wide for approximately 100 yards. Overall, the channel is well defined except for a short segment near Crag Trail crossing where the it meanders somewhat. The stream is generally not navigable.

Botany:

The river passes through vegetation zones from sub-alpine meadows through mountain hemlock-lodgepole pine association to Douglas fir-western hemlock forest. The latter type presents a very cool and shady setting with large mossy "park-like" areas. Most of the corridor below Roaring Creek is allocated as an Old Growth Grove in the existing and proposed land management plans. No presently listed threatened or endangered species are known to be present.

Cultural Resources:

The South Breitenbush Trail was an early administrative trail. It also received significant recreational use for its day. Numerous trees near Breitenbush Gorge bear carved names and dates from the early 1900's. It is assumed the trail was on, or very near, aboriginal routes between the Jefferson Park area in the wilderness and Breitenbush Hot Springs, just downstream of the confluence. Significant lithic scatters have been found at both ends of the corridor. The general area within the corridor has not been intensively surveyed, but several incidental finds have been recorded.

Timber:

The portion of the river corridor that is eligible for Scenic River designation includes about 3,583 acres. Stands of old growth Douglas fir and western hemlock occupy the area. Estimated ASQ without designation is approximately

0.5 MMBF and 0.4 MMBF if this area were designated as a Scenic River.

Livestock Grazing:

There are no grazing allotments within or near the corridor.

Socioeconomic Effects:

The South Fork of the Breitenbush River is within a two-hour driving time of Bend, Eugene, Salem and Portland. It is accessible by paved roads except for a short distance travelled on Forest Road #4685. National Forest campgrounds, private resorts, a large state park and Detroit Reservoir are major recreation attractions within a few miles of the river. The local economy is dependent on timber, although tourism is significant and growing. Community and business associations are actively working to further diversify the economy. Designation would likely increase the number of visitors to the area, benefitting tourist related business.

Segment 1 is completely within the Mr. Jefferson Wilderness. Segment 2 includes allocations of Old Growth Grove, Scenic Influence II and General Forest. Proposed allocations would dedicate the core area of the corridor adjacent to the river to Old Growth Grove and Retention-foreground. Portions of the outer edges of the corridor would have a management direction of Partial Retention-middleground and General Forest. Designation as a Wild and Scenic River would not appreciably reduce timber harvest from what these allocations provide.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Detroit Ranger District.

Funding Needs if Classified as a Wild and Scenic River:

The following are expected funding requirements for the South Fork of the Breitenbush River for the next five years.

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expense Expected with Designation**
General Administration	$15,000	$8,000
Implementation		$10,000
Development of Management Plan		$130,000
Development	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

This river was not studied or considered for designation as a Wild and Scenic River in the DEIS and Draft Forest Plan. However, the outstandingly remarkable values and characteristics of the South Fork of the Breitenbush River will be protected in the current Forest Plan and proposed Forest Plan until a determination of suitability for Wild and Scenic status is made.

BREITENBUSH RIVER

Potential Wild and Scenic River

State of Oregon Willamette National Forest Marion County

The Breitenbush River has been studied for potential Wild and Scenic River designation. Initially, the river was included in the Nationwide Rivers Inventory in 1980. This review was conducted by the Heritage Conservation and Recreation Service, now part of the U.S. Park Service. The river was found to be ineligible at that time and was removed from the inventory.

In subsequent years, public interest in, and use of, resources within the corridor has increased. Consequently, the Breitenbush River was identified for review again through public input to the Willamette National Forest DEIS and Draft Forest Plan, which was released in December, 1987. In order to ensure public participation in the eligibility process, the river was included with other streams being evaluated. This report summarizes the results of the second review.

Location:

From the confluence of the North and South Forks of the Breitenbush River in the NW 1/4 of Section 21, T.9S., R.7E., to Detroit Reservoir near Canyon Creek is the NE 1/4 of Section 36, T.9S., R.5E., W.M. (10.0 miles)

Eligible for Designation:

Segment 1	From the confluence of the North and South Forks of the Brietenbush River to Detroit Reservoir near Canyon Creek.

Outstandingly Remarkable Values:

The most outstandingly remarkable value of the Breitenbush River is the variety and quality of recreational opportunities. The entire river length is intensively used. Recreational pursuits include camping, fishing, commercial resort activities, kayaking, hiking, recreational driving and general enjoyment of the forest environment. Additional distinctive features within the corridor are quality of the ecological setting and wildlife variety. The area contains magnificent stands of "old growth" timber, heavy use by elk and deer and habitat areas for sensitive and threatened species.

River Mileage:

Study:	10.0 miles
Eligible:	10.0 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Segment 1	Scenic	10.0 miles

Land Ownership:	**River Miles**	**Corridor Acres**

Willamette National Forest	9.5	3,040
Private	0.5	160
Total	**10.0**	**3,200**

Mineral and Energy Resource Activities:

There are no known mineral claims within the corridor. The area has low potential for locatable minerals. A portion of the corridor in the vicinity of Breitenbush Hot Springs is within a Known Geothermal Resource Area (KGRA). This suggests a high potential for development. Preliminary exploration activities were undertaken by several companies from 1978-1980. To date, there has been no interest expressed in pursuing development. Similar work has been performed throughout the KGRA, also without further development.

Water Resources Development:

Some channeling has been done on private land to protect structures and create a partial diversion for power generation. Diverted water is returned to the river on the private land. A buried log on National Forest land, just below the private boundary, raises the river approximately four feet. This allows some water to flow into a power generator beside the river at a resort development under Special Use Permit. Diverted water is returned immediately to the river.
There are no planned impoundments or other diversions on the river.

Transportation, Facilities and Other developments:

Forest Road #46, a paved two lane route, parallels the river the length of the corridor. This route crosses the river once with a concrete bridge. The river is also crossed by Forest Road #2231 near Cleator Bend Campground, also via concrete bridge. Several local roads are in the corridor, which provide access to timber management areas, recreation sites and a private resort.

Timber harvest activity has occurred in the corridor in several locations. Eagle Rock area, adjacent to the river, was burned by wildfire in 1967. The timber was subsequently salvaged. It is now fully reforested and has been precommercially thinned.

A High voltage transmission line managed by Bonneville Power Administration runs the length of the corridor. It crosses the river twice with overhead lines.

Three fully developed campgrounds are adjacent to the river. Numerous dispersed campsites are located along road 46 and the river. A commercial resort is located on private land immediately downstream from the headwaters. It is operated as a healing retreat and conference center with a primary focus on Breitenbush Hot Springs as an attraction. It primarily serves groups on a reservation basis. A second commercial resort (presently being reconstructed) is located on National Forest land. It will be operated as a destination resort featuring natural hot water, bathing, dining and lodging serving the general public. It is operated under a Special Use Permit. A system trail follows the river for one mile below Humbug Campground.

Recreation Activities:

The river provides a variety of recreation opportunities. Developed and dispersed camping and fishing are the most popular activities. Early season kayaking, hiking and swimming also occur. The river is

a major element in the scenic drive along Forest Road #46. This is a loop route connecting to Portland. The corridor receives heavy recreational use from May through October.

Wildlife and Fisheries:

Portions of proposed habitat areas for spotted owls and pileated woodpeckers are within the corridor. The corridor is entirely within big game winter range. Deer and elk are frequently sighted in the area.

The river has a population of native cutthroat trout. Oregon Department of Fish and Wildlife periodically plants legal size rainbow trout at several locations throughout the summer. The lower 1/2-mile has a spawning run of Kokanee (land-locked silver salmon) from Detroit reservoir in the fall.

Streamflow:

The river flows year around its entire length. Water is generally clear and of high quality. Brief periods of discoloration occur during heavy winter rainstorms.

Geology:

The river begins at the end of a broad glacial outwash plain. It quickly enters a steep sided channel which constrains it the rest of its length. This results in alternating rapids and deep pools for much of its course.

Botany:

The river corridor is forested with virgin Douglas fir/western hemlock associations and young plantations, primarily of Douglas fir. Many flowering brush species, including rhododendron and flowering currant add spectacular color in the spring. In fall, vine and big leaf maple present many hues of yellow, gold and red to river users and those travelling the road.

Cultural Resources:

Prehistoric use is known to have occurred along the entire length of the river for thousands of years. Major deposits of lithic material have been found in the vicinity of Breitenbush Hot Springs and along the former river channel in, what is now, Detroit Reservoir. Historic use along the river included trapping, development of a hotel and lodge at the hot springs and logging by railroad. Breitenbush Guard Station, still in active service, is listed on the National Register of Historic Places. It is an example of Depression Era construction by the Civilian Conservation Corps.

Timber:

The portion of the river corridor that is eligible for designation as a Recreation River includes about 3,200 acres. Stands of old growth Douglas fir and western hemlock occupy the area. Estimated ASQ withour River designation is approximately 1.2 MMBF and 1.1 MMBF if this area were designated as a RecreationRiver.

Socio-economic Effects:

Current land management allocations for the corridor includes Scenic I and II and General Forest. Proposed allocations under the new land management plan are Scenic Retention-foreground along the river and Scenic Modification-middleground on the outer edges of the corridor.

Current Administration:

The corridor is administered by the Willamette National Forest, Detroit Ranger District, except for the tract of private land at Breitenbush Hot Springs.

Funding Needs if Classified as a Wild and Scenic River:

The following are expected funding requirements for the Breitenbush River for the next five years.

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expense Expected with Designation**
General Administration	$15,000	$8,000
Implementation		$10,000
Development of Management Plan		$130,000
Development	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

This river was not studied or considered for designation as a Wild and Scenic River in the DEIS and Draft Forest Plan. However, the outstandingly remarkable values and characteristics of the Breitenbush River will be protected in the current Forest Plan and proposed Forest Plan until a determination of suitability for Wild and Scenic River status is made.

NORTH SANTIAM RIVER

Potential Wild and Scenic River

State of Oregon Willamette National Forest Linn County

The North Santiam River, above Detroit Reservoir, has been studied for potential Wild and Scenic River designation. It was identified for review through public input to the Willamette National Forest DEIS and Draft Forest Plan which were issued in December, 1987.

Location:

From the headwaters at Santiam Lake in SE1/4 of Section 34, T.12S., R.71/2E in Mount Jefferson Wilderness to Dry Creek in the NW1/4 of Section 17, T.10S., R.6E, W.M.

Segment 1	Santiam Lake to wilderness boundary (3.8 miles).
Segment 2	Wilderness boundary to bridge on State Highway 22 (4.2 miles).
Segment 3	State Highway 22 to Rainbow Creek (19.5 miles).
Segment 4	Rainbow Creek to Dry Creek (3.5 miles).

Eligible for Designation:

Segments 1, 2 and 3.

Outstandingly Remarkable Values:

The most outstandingly remarkable values of the North Santiam River are its ecological setting and its wildlife. The river corridor includes vegetative associations ranging from sub-alpine meadow to Douglas fir/western hemlock "old growth." Big Meadows, a very large wet meadow adjacent to the the river, is a significant complex of ecosystems. The variety of wildlife and density of wildlife use within the corridor has long been an attraction to visitors.

A distinctive feature of the corridor is the range of recreational opportunities present. Visitors can enjoy camping experiences from developed to primitive settings on a single trail system. Portions of the corridor are used year-around. This variety of opportunities is a result of an unusual combination of land management allocations along the upper reaches of the North Santiam River. The corridor has a progressive transition in land management direction and recreation opportunity from Roaded Modified through Semi-primitive Motorized and Non-motorized to Wilderness. The intensity of timber management is gradually reduced through longer rotations and smaller unit sizes to directly enhance the recreational and wildlife resource values in the area.

River Mileages:

Study:	31.0 miles
Eligible:	27.5 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Segment 1	Wild	3.8 miles
Segment 2	Scenic	4.2 miles
Segment 3	Recreation	19.5 miles

Land Ownership:	**River Miles**	**Corridor Acres**
Willamette National Forest	27.5	9,450s

Mineral and Energy Activity:

There are no known mineral claims within the river corridor. The land has low potential for locatable minerals or geothermal development.

Water Resource Development:

There are no existing or planned dams or diversions on either river segment.

Transportation, Facilities and Other Developments:

Portions of several system trails are within the corridor of both segments, east of Forest Road #2257. Some segments run parallel to the river, but are generally not visible from the river. The river is crossed by trail fords at three points. Additional trail mileage is proposed within the corridor. The river is crossed at a right-angle by Forest Road #2257, providing the only vehicle access to the river within the corridor. The crossing structure is twin metal culverts.

Big Meadows Campground, a nine unit facility designed for equestrian use, is in the corridor, west of Forest Road #2257. There are plans to add additional camp units to this facility. A few timber harvest units are within the corridor but not visible from the river.

Recreation Activities:

Principal attraction of the area is its primitive setting. Main activities in the corridor are camping, hiking, horseback riding, hunting, fishing and general enjoyment of nature. Although there is little direct access to the river by roads and trails, cross country access is not difficult. The area in the vicinity of Big Meadows receives significant winter use in the form of cross-country skiing. The area east of Forest Road #2257 is closed to motorized vehicles including snowmobiles. Motorized use west of the road is not specifically restricted, but is essentially non-existent.

Wildlife and Fisheries:

The corridor is within a Spotted Owl Habitat Area in the vicinity of Big Meadows. The general area serves as calving and summer range for a large herd of elk. Some of the recreation trails are heavily used by big game. Beaver activity is readily evident in numerous places along Segment 2. Small native cutthroat trout are present. The river is not stocked with fish.

Streamflow:

The North Santiam River is a Class I stream. It is the principal source of potable water for several downstream municipalities, including the city of Salem.
Segment 1 flows intermittently during late summer. Segment 2 has relatively constant flow, year-around. The river is free of pollutants and rarely exhibits high turbidity or discoloration, even during snowmelt and periods of high rainfall. There has been no channelization or bank stabilization work along segment 1. The bank of segment 2 has been stabilized with coarse rock at the crossing of Forest Road #2257. This work only extends a few feet above and below the culverts to prevent erosion of filled material.

Geology:

The river source is a collection of smaller streams draining lake basins near the summit of the Cascades. It passes through relatively gentle terrain formed by glaciation and washing of soft volcanic materials.

Botany:

Vegetation along Segment 1 varies from sub-alpine meadow types to a mountain hemlock-silver fir association at lower elevations. The corridor of Segment 2 is forested with a mixed species stand of Douglas fir, silver fir, western hemlock and Engleman spruce. Shrubs include rhododendron, vine maple and several species of huckle-berry. Ground cover consists of bear grass, twinflower, prince's pine and mosses. No listed plants are known to be present. The corridor has been intensively surveyed where activities have been proposed. However, a survey of the general area has not been done.

Cultural Resources:

Intensive survey for historic and prehistoric resources has been accomplished wherever activities have been proposed within the corridor. The general area has not been surveyed, however. There are two known gravesites within the
corridor. No significant prehistoric sites have been found, but the area is presumed to have high potential for sites in some locales.

Timber:

The portion of the river corridor that is eligible for designation as a Wild and
Scenic River includes about 9,450 acres. Stands of Douglas fir, western hemlock and silver fir occupy the area. Estimated ASQ without river designation is approximately 0.4 MMBF and 0.3 MMBF if this area were designated as a Wild and Scenic River.

Livestock Grazing:

There are no grazing allotments within the corridor.

Socio-economic Effects:

This area is within a two hour drive of the Willamette Valley from Portland to Eugene and the Central Oregon cities of Bend, Redmond and Sisters. It is adjacent to Mt. Jefferson Wilderness, one of the heaviest visited in the Region. Designation would likely increase visitation to the area. An increase in use would benefit tourist related businesses locally and regionally. Current land management allocation for the corridor of Segment 1 is Wilderness. Segment 2 includes Dispersed Non-motorized Recreation/ Timber and General Forest. Segment 3 includes scenic retention foreground. The proposed Forest Plan would retain the dispersed recreation and scenic retention foreground allocations and change the General Forest allocation to Partial Retention Foreground. The management direction for current allocations is compatible with a Wild and Scenic River designations of both "scenic and recreation."

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Detroit Ranger District.

Funding Needs if Classified as a Wild and Scenic River:

The following are expected funding requirements for the North Santiam River for the next five years.

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expense Expected with Designation**
General Administration	$15,000	$8,000
Implementation		$10,000
Development of Management Plan		$130,000
Development	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

This river was not studied or considered for designation as a Wild and Scenic River in the DEIS and Draft Forest Plan. However, the outstandingly remarkable values and characteristics of 27.5 miles of the North Santiam River will be protected in the current Forest Plan and proposed Forest Plan until a determination of suitability for Wild and Scenic status is made.

QUARTZVILLE CREEK

Potential Wild and Scenic River

State of Oregon Willamette National Forest Linn County

Quartzville Creek has been studied for potential Wild and Scenic River designation. It was identified for review through public comment to the DEIS and Draft Forest Plan, which was published in December, 1987.

Location:

From the headwaters in T. 11S., R.5E., Section 35, N.E. of the N.W. to the Forest boundary (12.3 miles).

Segment 1	From the headwaters to an unnamed creek west of Brule Creek.
Segment 2	From an unnamed creek west of Brule Creek to the Forest boundary

Eligible for Designation:

Segments 1 and 2

Outstandingly Remarkable Values:

Quartzville Creek has numerous values which cause it to stand out. It is very scenic as a rapid current flows through large exposed boulders, cascading into deep pools. The canyon sides are steep and incised with old growth timber down to the water. Recreation values are high as the road parallels the creek most of it's length. There are many dispersed sites which receive user in the summer and fall. Fishing is also popular as the state maintains a stocked fishery of rainbow trout. The area is also rich in mining history and prehistoric sites along the creek. Wildlife is abundant throughout the area. Osprey nests and pine marten habitat areas are present.

River Mileage:

Study	12.3 Miles
Eligible	12.3 Miles
Draft Forest Plan	0.0 Miles

Potential Classifications:

Segment 1	Recreation	2.3 Miles
Segment 2	Recreation	10.0 Miles

Land Ownership:	**River Miles**	**Corridor Acres**

Willamette National Forest	12.1	3,761
Private	.2	58
Total	**12.3**	**3,918**

There is one private parcel within the corridor. It is a patented mining claim located in T. 11S., R.4E., Section 27 S.E. of the S.E.

Mineral and Energy Activity:

There are many placer mining claims within the corridor and a few lode claims. Quartzville mining district is well known and has a rich history of mining activities for 150+ years. The potential for continued and increased mining activity is high.

Water Resource Development:

There are no existing impoundments nor potential water resource development sites within the proposed eligible segment.

Transportation, Facilities, and Other Developments:

Forest Road 11000 parallels the creek for approximately the lower 8 miles. There are 6 concrete bridges and one wood/steel structure that cross the creek. Adjacent to the creek near it's confluence with McQuade Creek there is a mining operation that consist of a settling pond, a road along McQuade Creek, wooden bridge (mentioned above), and semi-permanent residence. Dispersed campsites are scattered along the creek over most of its length.

Recreation Activities:

Fishing is a popular pastime on the Quartzville Creek for native as well as stocked trout. Some swimming occurs in the deep pools od the Creek, however cold water temperatures tends to limit this activity. Sightseeing, driving for pleasure, and picnicking occur throughout the corridor as the road is a through connector to Highway 22 from Highway 20. Dispersed camping during the summer and fall is common. Many of these sites are related to mining claims. The Middle Santiam Wilderness lies to the south of Quartzville Creek and is accessed via the McQuade Creek trail. Mining is a significant recreational activity in the corridor below Freezeout Creek. The area is rich in big game and upland birds and hunting is a very popular recreational activity during the fall season.

Wildlife and Fisheries:

The creek drainage provides habitat for numerous species of big game, including elk, deer, bear and cougar. Smaller game such as pine marten are also dependent on this ecosystem for survival. The lower part of the creek serves as winter range for elk and deer. Osprey are evident in the area also. Fisheries consist of native and stocked trout. Some steelhead have been introduced to establish a future run.

Streamflow:

Streamflows are adequate to maintain the native fisheries. The creek is very clear and blue green. It is considered to be of high quality with limited pollutants introduced by humans. Heavy rainfall brings short term sedimentation and discoloration.

Geology:

The geology of the area is derived from volcanic origin with basalt outcrops on the surface. The creek falls consistantly with numerous small waterfalls over bedrock. Boulders are common all through the corridor in the creek bed itself. Generally steep incised draws cut through ridge systems throughout the area.

Botany:

An old growth ecosystem dominates the corridor with clearcutting occuring along the creek in the upper reaches. Douglas fir, hemlock and cedar are the dominant species. Hardwoods such as alder, maple, and vine maple are prevalent. The understory consists of rhododendron, swordfern, bracken fern and other reparian related species.

Cultural Resources:

There is evidence of prehistoric use along the flat areas near Quartzsville Creek. The area was likely used as a summer travelway and for fishing and hunting by Native Ameicans.

Timber:

The portions of the river corridor that are eligible for designation as a Wild and Scenic River include about 3,918 acres. Timber stands within proposed corridor are primarily old growth Douglas fir and western hemlock. Estimated ASQ for this area without river designation is approximately 2.5 MMBF and
2.1 MMBF if this area were designated as a Wild and Scenic River.

Livestock Grazing:

There are no grazing permits in this area.

Social-Economic Effects:

The local economy is timber dependent and would suffer minor loss of timber production resulting from designation of this river corridor. Designation would likely increase recreation use of the area and would benefit local tourist related business.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Sweet Home Ranger District.

Funding Needed if Classified as a Wild and Scenic River:

The following are expected funding requirements for Quartzville Creek for the next five years.

Cost category	Expenses Expected Independent of Designation	Additional Expense Expected with Designation
General Administration	$15,000	$8,000

Implementation		$10,000
Development of Management Plan		$130,000
Development	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternative:

This river was not studied or considered for designation as a Wild and Scenic River in the DEIS or Draft Forest Plan. However the outstandingly remarkable values and characteristics of 12.3 miles of Quartzville Creek will be practiced in the current Forest Plan and proposed Forest Plan until a determination of suitability for Wild and Scenic Rivers status is made.

MIDDLE SANTIAM RIVER

Potential Wild and Scenic River

State of Oregon Willamette National Forest Linn County

The Middle Santiam River has been studied for potential Wild and Scenic River designation. It was identified for review through public comment to the DEIS and Draft Forest Plan which was published in December 1987.

Location:

From the confluence of two streams in T13S., R5E., north edge of section 25 on private land to Green Peter Reservoir.

Segment 1	From the confluence of two streams in T13S., R6E., north edge of section 25 on private land to where river leaves private land in section 31 T12S., R5E. (6.0 miles)
Segment 2	From section 36, T12S., R5E., to Forest Road (F.R.) 2041. (2.0 miles)
Segment 3	From F.R. 2041 to Western Forest Boundary (6.0 miles)
Segment 4	From Western Forest Boundary to Green Peter Reservoir (7.8 miles)

Eligible for Designation:

Segments 2 and 3.

Outstandingly Remarkable Values:

The Middle Santiam River has several remarkable values: large, high density stands of old-growth timber, spectacular scenery, an excellent trout fishery and outstanding opportunities for geological interpretation involving large land flows.

The river's scenery, coupled with the geological and ecological/biological uniqueness, and it's proximity to a major population area give this river outstanding recreational opportunities.

Segment 3 of this river lies wholly in the Middle Santiam Wilderness Area as well as flowing through a designated Research Natural Area. It flows through spectacular old-growth forests of western red cedar, hemlock and Douglas-fir including an area with a volume of (450M) per acre that is located right on the river. In addition to the ecological/biological attributes, the corridor offers geological interpretation with a large land flow on the eastern end of this segment. The area is suitable spotted owl habitat as well as elk range. Segment 2 also includes spotted owl habitat. In addition, this segment contains both historical and prehistorical sites. Shed Camp, located approximately mid-way in this segment dates to 1912. Several prehistoric sites have been identified.

River Mileage:

Study:	21.8 Miles
Eligible:	8.0 Miles
Draft Forest Plan:	0.0 Miles

Potential Classification:

Segment 2	Scenic	2 Miles
Segment 3	Wild	6 Miles

Land Ownership:	**River Miles**	**Corridor Acres**
Willamette National Forest	8.0	2,346

Mineral and Energy Resource Activities:

There are no known mining claims within the corridor of Segments 2 or 3. No interest has been expressed in locatable mineral exploration or development in segment 2. Segment 3 is a designated Wilderness so it is withdrawn from mineral entry. There are no geothermal leases in the corridor nor any oil or gas leases.

Water Resource Developments:

There are no existing impoundments nor potential water resource development sites within the proposed eligible segments.

Transportation, Facilities and Other Developments:

Forest Road 2047733 is located about 1/3 mile from the beginning of segment 2. This road is gated. Forest Road 2042 is located about 1/2 mile from the beginning of segment 2. Forest Road 2041 crosses the river with a concrete bridge and is the ending point of segments 2. Timber harvest activity has taken place near the corridor in segment 2 and is visible from the river. No harvest activity is visible from segment 3.

Recreation Activities:

The majority of this river corridor lies within a designated Wilderness. There are no trails directly to the river. Use is primarily fishing in the vicinity of the bridge on Forest Road 2041, hunting, and people engaged in orienteering within the Wilderness. Access from the west is limited due to large tracts of private land outside the Forest.

Wildlife and fisheries:

Wildlife species that inhabit the drainage include the northern spotted owl, pine marten, elk, deer, black bear, beaver, bobcat, cougar, and numerous species of small birds and mammals. The drainage is a major elk winter range. The river has brook, rainbow, and cutthroat trout. Because of the dams downstream, there is no anadromous fishery.

Streamflow:

Streamflows are adequate to sustain a native fishery. The river is generally considered to be of high quality and free from manmade pollutants. During periods of heavy rainfall, sedimentation causes short-term discoloration.

Geology:

The river flows through volcanically derived rock of the Western Cascade Sequence.

Botany:

Segment 2 includes some true firs as well as the old-growth western red cedar, hemlock and Douglas-fir that occur in segment 3. The understory species include rhododendron, swordfern, bracken fern, salal and Oregon grape.

Cultural Resources:

The Middle Santiam River drainage was used extensively by prehistoric man. Many significant cultural sites exist along the river is both segments 2 and 3. In addition, segment 2 contains the historical Shed Camp which dates to 1912.

Timber:

The portions of the river corridor that are eligible for designation as a Wild and Scenic River include about 2,346 acres. Timber stands within a portion of the corridor that are available for timber harvest (Segment 2) consist of old growth Douglas fir, western red cedar and western hemlock. Estimated ASQ for this area, without river designation, is approximately 0.5 MMBF and 0.3 MMBF if this area were designated as a Wild and Scenic River.

Livestock Grazing:

There are no existing grazing allotments in this corridor.

Socio-Economic:

The local economy is heavily dependent on the timber industry. Designation would have little impact on the economy as the majority of the river corridor lies within a designated Wilderness. Timber harvest would continue but at reduced rates within segment 2. Tourism is a growing industry in Linn County and designation would likely attract a greater number of recreationists to the area.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Sweet Home Ranger District.

Funding Needs if Classified as a Wild and Scenic River:

The following are expected funding requirements for the Middle Santiam River for the next five years.

Cost Category	Expenses Expected	Additional Expense

	Independent of Designation	Expected with Designation
General Administration	$15,000	$8,000
Implementation		$10,000
Development of Management Plan		$130,000
Development	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

This river was not studied or considered for designation as a Wild and Scenic River in the DEIS or Draft Forest Plan. However the outstandingly remarkable values and characteristics of 8.0 miles of Middle Santiam River will be protected in the current Forest Plan and proposed Forest Plan until a determination of suitability for Wild and Scenic Rivers status is made.

SOUTH SANTIAM RIVER

Potential Wild and Scenic River

State of Oregon Willamette National Forest Linn County

The South Santiam River has been studied for potential Wild and Scenic River designation. It was identified for review through public comment to the DEIS and Draft Forest Plan that was published in December, 1987.

Location:

From the headwaters of Sevenmile Creek beginning at edge of a clearcut in T.14S., R.5E., Section 13 N.E. downstream to western forest boundary.

Segment 1	From the headwaters of Sevenmile Creek at edge of a clearcut in T.14S., R.5E., Section 13, N.E. 1/4 downstream to where stream enters private land T.14S., R.5E., Section 9 (4.0 miles).
Segment 2	From the headwaters of Squaw Creek beginning at the confluence of two streams on the east edge of Section 21, T.14S., R.5E., downstream to its confluence with the South Santiam River in T.14S., R.5E., Section 9, N.W. of N.E. 1/4 (2.7 miles).
Segment 3	South Santiam River from its confluence with Squaw Creek and Seven Mile Creek where it enters Forest Service land in Section 5, T.14S., R5E., downstream to western forest boundary (15.3 miles).

Eligible For Designation:

Segments 1 and 3.

Outstandingly Remarkable Values:

The South Santiam River has several remarkable values. It flows through old-growth forest, with steep side canyons and cascading water falls providing outstanding scenic opportunities. The upper reaches sustain a native fishing and provide habitat for elk as well as old growth dependent species such as Pine Marten. In addition the historic Old Santiam Wagon Road parallels most of the river providing an opportunity for interpretation of the areas colorful history.

River Mileage:

Study	22.0 Miles
Eligible	19.3 Miles
Draft Forest Plan	0.0 Miles

Potential Classifications:

Segment 1	Wild	4.0 Miles
Segment 3	Recreation	15.3 Miles

Land Ownership:	**River Miles**	**Corridor Acres**
Willamette National Forest	14.8	4,563
Private	4.5	1,430
Total	**19.3**	**5,993**

There are several parcels of private land in the corridor. They are located in T.14S., R.5E., Section 5; T.13S., R4E., Section 25, 26, 34 and T.13S., R.3E., Section 36 and 34.

Mineral And Energy Activities:

There are no known mining claims within the corridor of the river. No interest has been expressed in locatable mineral exploration or development, and the lands within the corridor have low mineral potential.

Water Resource Developments:

There are no existing impoundments nor potential water resource development sites within the proposed eligible segments.

Transportation, Facilities And Other Developments:

State Highway 20, a two laned paved road, parallels the river, to where it enters T.13S., R.5E., Section 31, and crosses the river one time in T.13S., R3E., Section 36. Forest Road 2044, a single lane gravel surfaced road crosses the river in T.14S., R.SE., Section 5. There are five road bridges and one log footbridge that also cross the river. The Old Santiam Wagon Road (Forest Service 2042-302) parallels the river from T.13S., R.3E., Section 36 to T.14S., R.5E., Section 10 and provides hiker and equestrian access to areas within the corridor.

Piers from two old bridges. One at Longbow and the other at the Long Ranch. Power lines and telephone lines parallel the river from the the Forest boundary on the west to T.13S., R.4E., Section 25. These are composed of both buried and above ground lines. A powerline crosses the river in T.14S., R.4E., Section 26. The Falls Creek Hydroelectric facility is located in T.14S., R.4E., Section 32 and is visible from Trout Creek Campground.

A recreation residence tract of 10 homes is established in T.13S., R.4E., Section 27. Longbow, a CCC organizational site, and four developed campgrounds lie along the river providing camping and picnicing opportunities.

Recreation Activities:

This is a popular river for fishing and is stocked with trout several times each season from T.14S., R5E., Section 5 to the western Forest boundary. Segment 1 above Road 2044 sustains a native fishery. Winter Steelhead inhabit the entire river.

Some swimming occurs at the five developed sites but the cold temperature of the water limit this activity. Five campgrounds are built on the banks of the river and camping and viewing scenery are

second only to fishing as an activity. An elk viewing area on the historic Long Ranch site is also a popular attraction.

The designation of the Old Santiam Wagon Road as a Special Interest Area will increase the number of users looking for historical and cultural opportunities. The Menagerie Wilderness lies on the North side of Highway 20. It is a 5,000 acre wilderness with numerous rock spires which are visible from the river.

There are three trailheads in the corridor. Two, Trout Creek and Rooster Rock, provide access to the Wilderness. The third, located at House Rock campground, crosses the river on a log bridge and provides access to a beautiful waterfall. Fall colors are spectacular and driving along the river is a very popular fall activity.

Wildlife and Fisheries:

This river drainage provides habitat to numerous species. Among these are old- growth dependent species such as the pine marten. It is likely habitat for species requiring a minimum of disturbance. Segment 1 is being surveyed as a likely Peregrin Falcon habitat. It is also elk winter range. In addition, there are osprey along segment 3 and a known northern Spotted Owl nest tree. The fishery consists of native trout, winter Steelhead and the Oregon Department of Fish and Wildlife stocked trout.

Streamflow:

Streamflows are adequate to maintain a native fishery. The river is generally considered to be of high quality with limited man made pollutants. During periods of heavy rainfall sedimentation causes short-term discoloration. There is some riprap along the river in House Rock Campground and Longbow Organizational Camp, but the streamflow is not affected.

Geology:

The river flows through volcanically derived rock of the Western Cascade Sequence. There are numerous basalt spires along the Corridor. A multitiered waterfall occurs near House Rock Campground. Squaw Creek and Sevenmile Creek which join to form the South Santiam River come together at a 180 degree angle. Segment 1 is marked by a steep very rugged canyon, well dissected with draws and with numerous exposed rock outcroppings. There are many large exposed boulders.

Botany:

Douglas-fir and western hemlock are the predominate species. The stands range in age from old-growth at the eastern end to mature second growth at the lower end of the river. Stands of western red cedar occur throughout the drainage. Hardwood species such as Alder, big leaf maple and vine maple exist all along the river. The understory consists of rhododendron, swordfern, bracken fern, salal and Oregon grape as well as many types of wildflowers.

Cultural Resources:

The South Santiam River drainage was a byway for both prehistoric and historic peoples. The area was used both for hunting and berry picking as well as a route to Central Oregon. Several prehistoric sites have been found along the river. In 1853 Andrew Wiley and party followed the South Santiam River east to locate the first pass across the Cascades south of the Barlow Road. This route became the Old Santiam Wagon Road and was used extensively by the early settlers of Oregon. Several way

stations were erected and remnants of these remain today as well as approximately 22 miles of the original wagon road.

Timber:

The portions of the river corridor that are eligible for designation as a Wild and Scenic River include about 5,993 acres. Timber stands within the corridor consist of both old growth and second growth. Douglas fir and western hemlock are the predominant species in the corridor. Estimated ASQ for this area, without river designation, is approximately 2.1 MMBF and 0.9 MMBF if the area were designated as a Wild and Scenic River.

Livestock Grazing:

An existing grazing allotment provides for grazing in the Elk Viewing Area pasture in T.13S., R.4E., section 32.

Socio-economic Effects:

The local economy is heavily dependent on the timber industry. Because of current and proposed Forest Plan classifications along the corridor, designation would have little effect on future timber harvests. If designated, harvest would be discontinued along Segment 1. Harvests would continue at current rates in the corridor, except within the riparian zone where harvest is not permitted.

Tourism is a growing industry in Linn County and designation would likely increase the number of tourists using Highway 20 as a primary route between Eastern and Western Oregon. There is commercial development (Mountain House Restaurant) on the north side of the river in T.13S., R.4E., Section 26.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Sweet Home Ranger District.

Funding Needed if Classified as a Wild and Scenic River:

The following are expected funding requirements for the South Santiam River for the next five years.

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expense Expected with Designation**
General Administration	$15,000	$8,000
Implementation		$10,000
Development of Management Plan		$130,000
Development	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternative:

This river was not studied or considered for designation as a Wild and Scenic River in the DEIS or Draft Forest Plan. However the outstandingly remarkable values and characteristics of 19.3 miles of South Santiam River will be protected in the current Forest Plan and proposed Forest Plan until a determination of suitability for Wild and Scenic Rivers status is made.

MIDDLE FORK WILLAMETTE RIVER

Potential Wild and Scenic River

State of Oregon Willamette National Forest Lane and Douglas Counties

The Middle Fork Willamette River has been studied for potential Wild and Scenic River designation. It was identified for review through public comment to the Willamette National Forest DEIS and Draft Forest Plan, which were issued in December, 1987.

Location:

From lower Timpanogas Lake in T. 25 S., R. 5 E., Section 15, NW 1/4 to slack water at Hills Creek Reservoir in T. 23 S., R 3 E., Section 4, SW 1/4 (Willamette National Forest).

Segment 1	From Timpanogas Lake (T. 25 S., R. 5 E., Section 15, NW 1/4 to the confluence of the Middle Fork Willamette River and Echo Creek (T. 24 S., R 4 E., Section 16, SW 1/4). This terminus was selected as the character of the river begins to change at this point (16.0 miles).
Segment 2	From the confluence of the Middle Fork Willamette River and Echo Creek (T. 24 S., R. 4 E., Section 16, SW 1/4) to slack water at Hills Creek Reservoir(T. 23 S., R. 3 E., Section 4, SW 1/4)(14.0 miles).

Eligible for Designation:

Segments 1 and 2

Outstandingly Remarkable Values:

The Middle Fork Willamette River has several outstandingly remarkable values: spectacular scenery, significant recreation opportunities, a wide variety of wildlife, a significant historic site, and the districts's most diverse ecological/biological site at Big Swamp.

The entire river drainage is managed under a viewshed plan. The river corridor is lined with hardwoods such as cottonwood and maple, and large old trees of Douglas-fir and western red cedar. A five hundred plus foot set of waterfalls and cascades, a gorge of 100 plus feet in height, numerous rock outcrops, cliffs, and islands offer photographic opportunities.

River Mileage:

Study:	30.0 miles
Eligible:	30.0 miles
Draft Forest Plan:	0.0 miles

Potential Classification:

Segment 1	Recreation	16.0 miles
Segment 2	Recreation	14.0 miles

Land Ownership:	**River Miles**	**Corridor Acres**
Willamette National Forest	29.75	10,841
Private Land	0.25	80
Total	**30.00**	**10,921**

One parcel of private land is located in T. 24 S., R 5 E., Section 21, SW 1/4 SW 1/4.

Mineral and Energy Resource Activities:

There are no known mining claims within the corridor of the river. Occasional recreational gold dredging can be observed but no interest has been expressed in development. The lands within the corridor have low mineral mineral potential, making entry unlikely. There are no geothermal leases on the river.

Water Resource Developments:

There are no existing impoundments, but the Army Corps of Engineers has identified potential water resource development sites within the proposed study area. Potential sites have been identified at the points along the Middle Fork where Coal Creek and Staley Creek enter the river. There has been some interest in the development of small hydroelectric facilities near the lower end of Hills Creek Reservoir with a diversion canal being built to take water from the Middle Fork several miles upstream from the reservoir.

Transportation, Facilities, and Other Developments:

Forest Development Road 21 is a paved, double lane road that parallels the river providing easy access to the river for better than one-half of the river's length. In areas, this road is visible from the river but for the most part, the road is not readily apparent. There are local roads in the corridor which provide access to timber management areas and recreation sites. In segment 1, the upper four miles of the river is isolated from roads except for Forest Road 2153 353 and Forest Road 2154 which provide crossings of the river.

Timber harvest activites have taken place along the corridor with some harvest units visible from the river. Four developed campgrounds and many dispersed campsites occur along the length of the river, especially in Segment 2 where motorhome/travel trailer camping use is high. There are six crossings of the river by roads along in the thirty mile length of the corridor.

Recreation Activities:

The Middle Fork Willamette River has its headwaters located in the Oregon Cascades Recreation Area at Timpanogas Lake. This is a popular river for dispersed camping as a result of the broad floodplain along most of the road accessible portion of the river. Fishing is probably the second most popular activity after camping. Water play in the forms of canoeing, tubing in pools, and just general water play take place during the summer months.

Hiking along the existing portions of the Middle Fork Trail provides scenic views, fishing holes, and photographic opportunities of rock outcrops, the gorge, mossy cliffs, and the fall color change of the hardwood leaves. The Middle Fork Trail is a river trail that will eventually follow the river along its entire length. The lower portion of the river is highly used by dispersed and developed site campers during holiday and summer weekends. There are thirty-nine plus dispersed campsites along the lower portion of the river and every available dispersed site and developed campgrounds are filled to capacity. User density is low in the upper isolated portion of Segment 1.

Recreation Activities (Estimated Recreation Visitor Days-RVDs):

Activity	**1989**	**2000**
Fishing	6,500	8,320
Camping Developed	8,162	10,447
Camping Dispersed	4,992	6,390
Hiking	500	1,200
Total	**20,154**	**26,357**

Wildlife and Fisheries:

Sensitive wildlife species known to inhabit the river drainage include bald eagle, two Northern Spotted Owl pairs, pine marten, and osprey. There is a productive pair of bald eagles located near the terminus of the lower portion of the river that successfully fledge at least two young annually. An osprey nest is located several miles upstream from Sand Prairie Camprground. Other species known to frequent the river are deer and elk in critical winter range, black bear, cougar, bobcats, and coyotes.

Wildlife viewing opportunities include river otters, mink, beaver, weasels, and skunks. Owls include Great Greys, screech, sawwhet, and pigmy; frogs include tailed, tree, and Red Legged; there are Northwest, Pacific Giant, woodland, and Oregon slender salmanders; and snake species include Northwestern, common garters, and rubber boas. Nesting waterfowl such as Western Grebes, mallard ducks and Canadian geese can be found in the river corridor. There are two pileated woodpecker habitat areas located in the corridor.

Fishing is an attraction due to the native cutthroat trout population and the stocking of rainbow trout in the lower portion of the river on a regular basis by the Oregon Department of Fish and Wildlife. There are four ODFW stocking sites on the lower portion of the river. Stocking is done to supplement the native fish populations due to heavy fishing. No threatened or endangered species are known to inhabit the river.

Streamflow:

Streamflows are adequate to maintain a fishery resource year-round. Only in the very upper portion of the river below Timpanogas Lake is the surface flow reduced to pools and moist gravel during late August and September. This distance is about one mile long. The river is generally considered to be of high quality and free from manmade pollutants. During periods of heavy rainfall, sedimentation causes short-term dicoloration.

Geology

The river begins its journey in the Recent Cascades volcanic rock and spills from the plateau down a series of cascades and waterfalls to the lower elevation Western Cascades geological formations. Along the way, the river passes through a 100 plus foot high gorge, past a series of natural springs in the Chuckle Springs area, and then flows through a series of braided channels and islands.

Botany

The upper reach of the river includes the high elevation true fir forest of noble fir, Pacific silver fir, and mountain hemlock. Along the channel, willow and alder can be found. At the lower elevations, Douglas-fir, western hemlock, and western red cedar are found. Adjacent to the river grow cottonwood and big leaf maple. Understory species include Oregon grape, rhododendron, twinflower, bracken fern, and vanilla leaf. There is the Paddys Valley Old Growth Grove. At Rigdon Meadows, there is the endangered and sensitive species of Sisyrinchium sarmentosum (endangered Oregon State and Regional Forester's sensitive species list for Washington and Oregon); and Carex comosa (sensitive Washington State and Regional Forester's sensitive species list for Washington).

Cultural Resources:

The river corridor hosts both historic and archaeological sites. About two-thirds of the river corridor was first accessed by the Oregon Central Military Wagon Road which dates back to the 1860's. The OCMWR provided a route from central Oregon to the lower Willamette Valley.

An important site along the river is Rigdon Meadows. The meadows were named for Stephen Rigdon who with his wife Zilphia operated a way station for travelers on the Oregon Central Military Wagon Road. They grazed sheep and cattle, sold meals, supplies, small items, and did blacksmith repairs until the 1890's. Rigdon Meadows was the site of a forest Servic Guard Station until the mid 1960's.

The upper segment of the river corridor is the site of old way trails, three prehistoric archaeologic campsites and lithic scatters. The lower segment contains twenty-eight prehistoric archaeologic sites the range from small lithic scatters to campsites. There are rockshelters, vision quest cairns, peel bark trees, and one cabin.

Timber:

The portions of the river corridor that are eligible for designation as a Wild and Scenic River include about 10,921 acres. Timber stands within the corridor consist of true fir, Noble fir and Pacific silver fir in the upper reaches of segment one. Douglas fir, western hemlock, and western red cedar are the predominant species in the lower reaches of the corridor. Estimated ASQ for this area, without river designation, is approximately 5.1 MMBF and 3.4 MMBF if the area were designated as a Wild and Scenic River.

Livestock Grazing:

There are no existing grazing allotments within the river corridor.

Socio-Economic Effects:

The Middle Fork Willamette River corridor begins less than fifteen miles from the town of Oakridge. The local economy is dependent largely upon the timber industry and to a minor extent upon recreation. Designation of the river would likely increase the number of people visiting the area. Any increase in recreation visitors would benefit the tourist related businesses in the area. Current management as well as the proposed Forest Plan reduce timber harvest in the river corridor due to the scenic resource and riparian management. Designation as National Wild and Scenic River would have limited effect on timber harvest in the area.

Current Administration:

The river corridor is wholly within and administered by the Willamette National Forest, Rigdon Ranger District.

Funding Needs If Classified as a Wild and Scenic River:

The following are expected funding requirements for the Middle Fork of the Willamette River for the next five years.

Cost Category	**Expenses Expected Independent of Designation**	**Additional Expense Expected with Designation**
General Administration	$15,000	$8,000
Implementation		$10,000
Development of Management Plan		$130,000
Development	$50,000	
Operation and Maintenance	$35,000	$5,000
Total - Five Years	**$100,000**	**$153,000**

General administration and operation and maintenance cost are estimated to continue at $15,000 annually.

Forest Plan Alternatives:

This river was not studied or considered for designation as a Wild and Scenic River in the DEIS or Draft Forest PLan. However, the outstandingly remarkable values and characteristics of both river segments will be protected in the current Forest Plan and proposed Forest Plan until a determination of suitability for Wild and Scenic status is made.

APPENDIX F

SELECTION OF HARVEST CUTTING METHOD

INTRODUCTION

This appendix documents the rationale used to determine appropriate harvest systems to be used in managing coniferous forest stands on the Willamette National Forest during the next 10 years (or the life of the Plan) where timber production is a management goal. Criteria for the selection of harvest cutting methods to be used on National Forests in Oregon are provided in 36 CFR 219.27(b) and in the Pacific Northwest Regional Guide (USFS, May 1984). These sources of direction are in turn derived from Legislation, Executive Orders, and administrative decision by the Secretary of Agriculture and the Chief of the Forest Service. Silvicultural systems (even-aged or uneven-aged) appropriate for use on the Willamette National Forest are identified for each management area where scheduled timber harvest may occur.

The intent here is to document the rationale for selection of the broad harvest cutting methods (even-aged or uneven-aged) to be applied on the Forest. The specific harvest treatment methods (such as clearcutting, seedtree cutting, or group selection) will be selected on a site specific basis, in accordance with direction contained in the Forest Plan, and as identified in environmental assessments or in silvicultural prescriptions written or approved by certified silviculturists.

The clearcutting, seed-tree, and shelterwood systems are even-aged systems; which means that all of the trees in the stand are approximately the same age. The single-tree and group selection systems are uneven-aged systems, the trees in the stand differ markedly in age, with at least three major age classes present. Uneven-aged stands have no beginning or end points in time. A full discussion of the current condition of the timber environment is in Chapter III, Affected Environment, Timber Section.

TIMBER YIELD AND REGULATION OF FORESTS AND STANDS

Timber yield is the amount of wood that is harvested periodically from a specified Forest area. The maximum yield allowed from a National Forest for a planning period (typically one decade), is called the Allowable Sale Quantity (ASQ). By Federal law (NFMA) Allowable Sale Quantity generally cannot exceed the Long Term Sustained Yield (LTSY) capacity of the Forest to grow wood. Within each National Forest, stands are managed by silvicultural systems to achieve continuous production of the allowable sale quantity. When this continuous production level is achieved, or the biological potential of a selected alternative is optimized, the Forest and tree stands are said to be "regulated."

A silvicultural system is a planned sequence of treatments, for controlling the species composition and structure of the vegetation during the life of a stand. A stand is a community of trees sufficiently uniform to be distinguishable as a silvicultural or management unit. A stand can be defined as a reasonably

homogeneous unit that can be clearly differentiated from surrounding stands by its age, composition, structure, site quality, or geography.

Management objectives for stands typically are combinations of forest products and uses. Examples are: specific amounts of livestock forage, water runoff, and wood products; kinds of wildlife habitat; and specific scenic view qualities. No single silvicultural system can produce all desired combinations of products and uses from a particular stand, or from a National Forest. Forests are managed by using combinations of silvicultural systems to achieve the forest management objectives. The combinations vary greatly, depending on the characteristics of local forest ecosystems and differing management objectives.

Selection of the appropriate silvicultural systems occurs at both the National Forest land management planning level and Ranger District project level, by considering the overall planning objectives and ecological characteristics of broadly-defined land classes. Examples of land classes are: areas suitable for growing commercial wood products; streamside management zones; and spotted owl habitat areas. At the Ranger District, project level selection of silvicultural systems is typically made by a certified silviculturist. Choices are based on matching the attributes of the silvicultural systems with specific management objectives and ecological characteristics for specific stands.

SILVICULTURAL SYSTEMS

A silvicultural system typically includes harvesting trees, growing new trees, and controlling competing plants. Harvesting is classified as regeneration cuttings (those that help to replace stands), and intermediate cuttings (those that maintain or improve the character of existing stands, i.e., thinning harvests).

Silvicultural systems are adaptations of natural occurrences. Nature makes "regeneration cuttings" by means of fire, insects, disease, wind, and other phenomena; by removing a single tree, a small group of trees, a stand, or sometimes a whole forest.

Regeneration cuttings strongly influence stand characteristics and management options. Therefore, the five major silvicultural systems are named after them: clearcutting, shelterwood, seed-tree, single-tree selection, and group selection. Each of these systems includes regeneration cuttings to establish new tree seedlings or sprouts, and intermediate cuttings to develop the desired stand characteristics, such as species composition, spatial distribution, and plant vigor. The first three silvicultural systems are often referred to as Even-aged Systems, while the latter two are called Uneven-aged Systems.

Even-aged Systems

Clearcutting is the harvesting, in one operation, of all merchantable trees in a stand. A new stand may be created by natural processes such as seeding from trees in adjacent stands, or by sprouting from the stumps or roots of the cut trees. The new stand can also be created by people through broadcast scattering of seeds, or by planting seeds or seedlings. On this Forest, clearcut stands are usually regenerated by planting seedlings. Site preparation for seeding, planting, and to reduce slash and debris created during harvesting operations, is completed primarily through broadcast burning.

The shelterwood system requires leaving sufficient trees per acre (typically 10 to 20), during the regeneration cutting, to provide an environment that protects (shelters) the seedlings of a new even-aged stand. Protection may be needed from harsh conditions such as hot or moisture poor sites, excessive moisture stress, or frosts in some forest areas. Regeneration under shelterwoods by planting seedlings

is a common practice on the Forest. After the seedlings have shown sufficient growth (called establishment), the shelterwood trees (overstory) can be harvested. The shelterwood system is the second-most commonly used system on the Forest, after the clearcutting system.

The seed-tree system requires leaving a few good seed-producing trees per acre (typically 3 to 10) during the regeneration cutting. These trees produce the seed needed to establish a new even-aged stand. Following seedling establishment, the seed trees can be harvested. This system has seldom been used for intensive timber management on the Forest. The primary reasons are frequent unreliability of seed production in the desired periods; invasion of cleared lands by unwanted vegetation (particularly shrubs); the poor economics of harvesting the few seed trees after natural seedlings were established; and the high risk of blowdown.

Uneven-aged Systems

In the single-tree selection system each tree is evaluated for its contribution to the desired characteristics of the uneven-aged stand. Regeneration and intermediate cuttings are usually done in one operation. The desired seedlings or sprouts grow in the spaces created by harvesting of individual trees.

The current use of this system on the Forest is slight, limited mostly to developed recreation areas to remove trees that pose a hazard to people.

The group selection system requires harvesting trees in small groups (less than about two acres). The openings created in the stand resemble miniature clearcuts. The uneven-aged stand consists of a mosaic of even-aged systems described above to manage much smaller units of land. Currently, the group selection system is used only in areas of high scenic values (highway or trail foregrounds).

BIOLOGICAL CONTRASTS AMONG FORESTS AND STANDS MANAGED BY DIFFERENT SILVICULTURAL SYSTEMS

Appearance

Variation in Tree Age

A Forest managed by even-aged silvicultural systems consists of a mosaic of even-aged stands that differ by the age of harvest and seedling, young trees, and mature timber that replaced the original stand. Every age class would be represented by approximately the same number of stands. A regulated forest managed by the group selection system would resemble forests managed by the even-aged silvicultural systems; except that the even-aged components (groups) would be much smaller and more numerous. By contrast, each stand in a regulated forest managed by the single-tree selection system would have trees of many ages (perhaps all ages).

The oldest (or largest) trees in any managed forest depend primarily on the management objectives, not on the silvicultural systems. In particular, the amounts of large trees or old growth to be produced or maintained depend more on the willingness to forego or reduce timber yields than on the kinds of silvicultural systems used to manage stands.

Variation in Developmental Stages

In the even-aged and group selection systems, all stages of forest development are present in the forest, including grasses, forbs, shrubs, tree seedlings, and larger trees. Each stage is represented by entire

stands or groups. By contrast, in the single-tree selection system the areas dominated by small plants such as grasses, forbs, or shrubs are commonly very small but they typically occur somewhere in every stand. In a regulated forest, the total area occupied by each stage should be about the same, regardless of the silvicultural system.

Occurrence of Shade-Tolerant and Intolerant Plants

Even-aged and group selection systems favor plants that can be readily established and which grow well in full sunlight (shade-intolerant plants). These include grasses, most forbs and shrubs, and many of the most valuable commercial tree species, such as Douglas-fir. The single-tree selection system favors plants that can be readily established and grow well at low light levels (shade-tolerant plants). Examples in Oregon forests are many ferns; a few grasses, forbs, and shrubs; many non-commercial hardwood tree species; and a few commercial conifer tree species, such as western hemlock, grand fir, Pacific silver fir, and western red cedar.

However, on low quality forest lands where lack of soil moisture or other soil conditions cause low plant densities, shading by trees is greatly reduced. There, shade-intolerant plants will persist if the single-tree selection system is used.

Diversity of Plant Species

Species diversity depends on the biological and physical environments as well as how the stands are managed under the different silvicultural systems. On moderate to high quality lands, stands managed by the single-tree selection system shift toward shade-tolerant species. This also means that the species diversity of plants near the ground would eventually be lower in stands managed by the single-tree selection system.

The composition of commercial tree species may be significantly increased or decreased during stand regeneration; depending on the environmental conditions, availability of natural seed, selection of species to be planted, and the success of the plantings. Potential seed trees of some species could have been harvested, or only certain species (for example, western hemlock) could regenerate naturally under the brush that can rapidly occupy newly harvested areas.

If both artificial and natural regeneration fail, the species diversity of commercial trees has been significantly reduced. The risk of a complete regeneration failure is least for the single-tree selection system. There is high probability of successful natural regeneration of all species where openings are small, seed sources are present, and ground environmental conditions are suitable for tree seedling establishment. The risk of loss of diversity in large openings can be reduced by planting all appropriate species, or by designating appropriate seed trees or shelterwood trees of mixed species.

Vertical Diversity

The vertical diversity in stands managed by the even-aged or group selection systems can be quite limited. Typically there is a single dominant layer of seedlings, saplings, or larger trees. However, usually there is considerable diversity in stands with the larger trees because some trees are significantly taller and have fuller crowns than others. Full vertical diversity still occurs over the forest, but not in each stand or group. By contrast, in the single-tree selection system, the vertical diversity within each stand should be much greater. Seedlings, saplings, and trees in larger tree classes should be seen from any point in the uneven-aged stand.

Tree Vigor

If the stands are well managed, tree and stand vigor should be independent of silvicultural systems. However, maintaining good vigor of small shade-intolerant species, such as Douglas-fir, can be very difficult in stands managed by the single-tree selection system. To promote vigor and growth of these trees, tree density may have to be reduced, which can significantly reduce tree biomass.

Many stands on the Willamette National Forest are infected with root diseases or dwarf mistletoes. With the group selection and single-tree selection methods it is very difficult and costly to maintain or improve tree vigor and productivity in infected areas. These root diseases and dwarf mistletoes infect other trees more easily in the uneven-aged stands.

Genetic Resources

Conservation of Genes

Genetic diversity is basically unaffected when natural or artificial regeneration of commercial tree species is successful. Successful artificial regeneration means that appropriate procedures are used during seed collection to ensure a large genetic diversity in the collected seed. However, if regeneration of a particular species were to fail repeatedly over broad areas, genetic diversity would be reduced.

Quality of Genes

Where improperly applied, the single-tree selection system can lead to "high-grading", which in turn reduces genetic quality for wood production. High-grading is the selective removal of the best trees (most rapidly growing, largest, and most valuable for wood), so that most regeneration comes from seed produced by thelower-quality, remaining trees. Leaving cull trees in shelterwood and seed tree cuts, and for wildlife tree replacement in clearcuts, can also cause problems.

The average genetic quality may be significantly lowered in a stand managed by the single-tree selection system, because of higher rates of inbreeding. Some forest geneticists theorize that inbreeding should also increase under the shelterwood or seed-tree systems. Nearby trees of the same species usually are closely related, and they can pollinate each other. The natural seedlings should be even more inbred. By contrast, artificial regeneration or natural regeneration from edges of large openings reduces the probability of significant inbreeding. Large openings facilitate pollen movement from more distant, less related trees.

Productivity

Scientific long-term comparisons of wood production using the different silvicultural systems have not been made anywhere in the world. Theoretically, the total biological productivity (biomass) may be greatest for stands managed by the single-tree selection system. This is because of more continuous tree cover, compared to the other systems. However, merchantable stand growth and timber yields may not be higher for the single-tree selection system. Merchantable yields are strongly influenced by managerial
factors.

MANAGERIAL CONTRASTS AMONG FORESTS AND STANDS MANAGED BY DIFFERENT SILVICULTURAL SYSTEMS

Public Concern

In the last two decades the clearcutting system and to a lesser extent the shelterwood and seed-tree systems, have generated controversy in the United States and Europe.

There are at least six major concerns in Oregon and on the West Coast:

- Clearcut areas are regarded as visually unattractive.
- The risks of significant soil erosion and loss of soil productivity are thought to be much greater for the clearcutting system.
- Regeneration of clearcut stands is thought to be unreliable.
- The risks of significant genetic losses are thought to be much greater for the clearcutting system because new stands may be monocultures.
- The use of chemical herbicides (strongly opposed by some groups and individuals) is thought to be much greater if even-aged systems are used, particularly the clearcutting system.
- Artificial regeneration is thought to be too costly.

All of these undesirable effects can occur under any silvicultural system. However, the risks of some are significantly different for certain systems. Other managerial aspects of the silvicultural systems are also discussed in the sections below. They cover: risk of major wildfires; risk of infestation by insect, disease, or wildlife pests; production of wildlife big game forage; protection of archaeological resources; administration of silvicultural projects; timber harvesting efficiency; genetic improvements in forests; and effects on fisheries and wildlife.

Effects On Scenic Quality

Uneven-aged silvicultural systems are usually better than even-aged systems for creating or maintaining naturally-appearing landscapes. Uneven-aged systems apply treatments on a small scale. The treatments are also more selective in nature, and are well distributed in the forest. However, long-term administration and prevention of natural wildfires are more difficult. (See the section on Risk of Major Wildfires).

Where timber management activities are not permitted to be visually evident, the single-tree selection system may be the only feasible alternative. All silvicultural systems may be feasible where the management objective is to maintain the desired landscape character, depending on the circumstances. However, the uneven-aged systems would generally be better than the even-aged systems. All silvicultural systems may also be feasible where timber management objectives are dominant over visual quality objectives. Similarly, if the landscape character needs to be improved, any silvicultural system could be appropriate. For example, small or large temporary openings, created by timber harvest, that blend with the existing environment, can help to achieve a pleasing landscape.

Management Risks Of Adverse Effects On Watersheds And Soils

The management risks depend more on the characteristics of the watershed and soils, and on the care and quality of work, than on the kind of silvicultural system used. Adverse effects associated with any silvicultural treatment can usually be avoided or mitigated. The major possible adverse effects are

erosion, sedimentation in waterways, soil compaction, and loss of soil productivity through soil or nutrient loss.

The risks of significant, cumulative erosion and sedimentation effects in watersheds usually depend more on road quality and location, and the time of year when activities occur than on silvicultural treatments. Extensive and frequent use of heavy machines can cause unwanted compaction of some soils. The risk of this occurring should not be different among the even-aged silvicultural systems. Risk may be be higher with uneven-aged systems due to the need for more vehicle access. Uneven-aged systems require more stand entries and increase risk of soil compaction.

The amount of risk of soil nutrient losses is increased where vegetation or litter is cleared or high-intensity fires occur. The risk due to clearing vegetation or litter is greater for the even-aged silvicultural systems. However, the risk of high intensity fuel is greater for the uneven-aged systems because of the ease of which a crown wildfire may occur. High-intensity fires may occur in any stand if controlled fires for site preparation are used improperly.

Management Experience

Timber harvesting has occurred in Oregon for over 140 years. However, the vast majority of experience with managing forests with the goal of regulating potential yields, has involved the even-aged silvicultural systems, particularly clearcutting.

Even-aged Systems - The oldest plantations on National Forest lands in the Region are about 80 years old. Some are soon to be harvested and replaced, thus completing the cycle of an even-aged silvicultural system. Extensive experience has been gained in the regeneration, promotion of young tree growth, intermediate cutting, and regeneration cutting treatments for even-aged systems in all major timber types in the region. Overall, artificial regeneration following clearcutting has been very reliable in Douglas-fir, and Mixed Conifer stands. Artificial regeneration has been significantly less reliable in high elevation noble fir or grand fir stands. The primary causes of planting failures are: (1) difficulties with consistently reproducing high-quality seedlings in the nurseries and (2) planting when the environmental conditions are inappropriate.

Wood Production

Need for Control of Competing Vegetation (Including the Use of Herbicides)

Control of competing vegetation is needed to ensure establishment and maximum growth of tree seedlings. Some have theorized that less control is needed in the single-tree selection system where tree cover is more continuous, resulting in fewer competing grasses, forbs, and shrubs. However, these competitors cause significant moisture stress in the seedling and sapling trees (in addition to the substantial moisture stress caused by the larger trees) thereby reducing their survival and growth. There is no compelling theoretical basis for concluding that the need for control of competing vegetation should be reduced. Major competing plants can retain good vigor for some time, when shaded by conifers. Using the single-tree selection system would definitely not reduce the need for controlling competition from such plants.

Frequency of control treatments varies by silvicultural system. Treatments under the single-tree selection system could be needed somewhere in every stand as often as every 5 to 10 years. The average treatment frequencies in the other systems are much lower. For example, in any of the even-aged systems, up to about three treatments may be needed until the stand is regenerated, a period that could exceed 50

years. Thus, the average period between treatments would be greater than 20 years. Regardless of the silvicultural system used, the total acres treated (and the total pounds of herbicide applied per acre, if herbicides were used) should be about the same over the long term.

The aerial application of herbicides (usually the most cost-effective and the most controversial method of applying herbcides) could not be used in the single-tree selection system. Depending on topography and vegetation structure, aerial applications of herbicides could also be impractical in the group selection system.

The Forest Plan incorporates the Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation. In implementing the Forest Plan through project activities, the Forest will comply with the Record of Decision issued by the Regional Forester dated December 8, 1988, and the Mediated Agreement of May, 1989. Use of all vegetation management techniques is allowed only when other methods are ineffective or will unreasonably increase project costs. Emphasis must be on prevention and early treatment of unwanted vegetation and full public involvement in all aspects of project planning and implementation. The Forest Plan FEIS directs that:

- The selection of a treatment method will be made at the project level based on a site-specific analysis of the relative effectiveness, environmental effects (including human health), and costs of the feasible alternatives, and that herbicides will be selected only if their use best meets management objectives; and

- Monitoring and enforcement plans to implement specific methods will be developed for site-specific projects and described in the environmental analyses for these projects.

Restrictions on treatments would change timber yields and vegetation management costs in the following ways:

- If chemical use is restricted, the costs of vegetation management would increase, but timber yields would not be significantly reduced. (Allocations of resources would not change as a result.)

- If prescribed burning is restricted, costs of planting, animal control, and vegetation management would increase but timber yields would not be significantly reduced.

- If chemical use and prescribed burning were both restricted, reforestation costs would increase and timber yields would be reduced in some areas where regeneration could not be assured.

In any of these cases, the Forest Plan would be reexamined to determine the extent to which outputs or effects would change.

Treatment Costs

The size of a treatment area is a major factor in determining treatment costs and managerial feasibility. Generally, costs per acre in intensively managed forests are higher when the treatment units are smaller. Therefore, the even-aged systems are the most cost efficient whereas the group selection and the single-tree selection system (in that order) are the least cost-efficient.

Regeneration by clearcutting is the most cost-efficient among the even-aged systems. Shelterwood and seed tree systems are less so, in that order. The removal of shelterwood trees or seed-trees, after the seedlings are established, is a second cost not incurred in the clearcutting system.

In theory, the total cost of natural regeneration should be less than for artificial regeneration. The costs of seed collection, nursery operations, seedling handling, and planting are eliminated in natural regeneration. Natural regeneration often results in much greater densities of trees than would be planted or are desireable. Also, unreliable seed production by many commercial tree species often delays natural regeneration, which reduces wood growth. This delay, in many cases would extend beyond the 5-year regeneration period required in NFMA. These factors, including an increase in costs of precommercial thinning, would offset the initial low cost of regeneration. If natural regeneration is to be used, the shelterwood and seed-tree systems are usually more cost-efficient than the uneven-aged systems.

Achieving Regulated Forests, While Maintaining Forest Timber Harvest Levels

A regulated Forest can be accomplished most easily with the even-aged or group selection silvicultural systems because of their flexibility in meeting special management and multiple-use objectives and can be prescribed over larger areas. When managed appropriately even-aged or group selection systems are practical and economical in terms of transportation and procurement of a volume of marketable trees, while facilitating control of desired vegetation species composition, density, and growth rates.

There are two critical disadvantages of the single-tree selection system. First, foresters lack the detailed information about trees needed for cutting on a stand-by-stand basis. There are tens of thousands of stands on a typical National Forest in Oregon with up to about ten thousand potential crop trees per stand. Currently, inventory data needed for the single-tree selection system are lacking for about two-thirds of these stands. Second, in the Maritime climate in Oregon, large forest wildfires are inevitable. Reforestation after these fires creates many new, even-aged stands. It is very difficult to regulate a forest under a single-tree selection system when substantial acreages of unplanned even-aged stands occur.

Planning, Contracting, and Record Keeping

The many small units used in the uneven-aged systems makes for ineffective and costly operation and administration. If stands in a typical Ranger District were managed by uneven-aged systems, in excess of 50,000 separate areas would have to be inventoried, planned for, treated, and monitored. Even with computers the management complexity would be very costly and time consuming for uneven-aged management. Therefore, the extent to which uneven-aged management systems are used for intensive timber management will necessarily be very limited.

Timber Harvesting

Five important aspects of timber harvesting are strongly influenced by the choice among silvicultural systems: (1) variability in sizes of harvested trees, (2) area to be harvested, (3) complexity of the haresting treatments, (4) the probability of causing significant damage to trees to be left in the stand, and (5) the probability of causing long-term root disease, mistletoe, and insect problems. The first three influence harvesting efficiencies, and the other two affect the vigor, tree stocking, and value of the residual stand.

There is wide size variation in trees harvested in each operation under the single-tree selection system. This reduces harvesting efficiency because logging equipment is size-dependent. However, this disadvantage could be insignificant in second-growth stands.

Harvesting in the single-tree selection system is much less efficient than for the other systems because more land must be treated in each operation to harvest the desired yield from the Forest.

The complexity of harvesting treatments is also greatest in the single-tree selection system. Identifying which trees to cut, determining where they are to be felled, felling the trees in the designated areas, and removing the trees or logs out of the stand without damaging the residual trees can be very difficult and costly. In the single-tree selection system, cuttings occur as frequently as every five to ten years. Logging damage to trees left to grow in the stand is typically greatest for the single-tree selection system because of the frequent entries. It is very difficult to selectively harvest trees in dense stands without damaging many residual trees, particularly on steep slopes. Damaged trees are often infected by wood-decaying fungi that can persist in the soil for long periods, thus retaining the capacity to infect new trees. The fungi reduce the windfirmness, vigor, commercial value, and stocking of residual trees. This characteristic is a particular concern in developed recreation areas where selection systems are often applied. In the other systems, only the intermediate cuttings are as complex. The regeneration cuttings in the other systems are more straightforward operations. Clearcutting is the most efficient.

Genetic Improvements in Forests

Genetic improvements to increase timber growth, improve tree form and wood quality, or increase resistance to disease and insect pests, depend primarily on planting trees with desirable genetic characteristics. Therefore, the potential for genetic improvement is greater for silvicultural systems that use artificial regeneration. The clearcutting, group selection, and shelterwood systems (if artificial regeneration is used) have the greatest potential for improving the genetic quality of forest trees. The single-tree selection system, which its natural regeneration and higher rates of inbreeding, has the least potential.

Risk of Major Wildfires

The even-aged systems (clearcutting in particular) are best for reducing the risk of major wildfires because the greater control of fuel distribution makes wildfire prevention and suppression easier and less costly. The single-tree selection system is least desirable because fires burn intensely and are more difficult to control. Openings which can serve as fuel breaks occur less frequently in forests or stands managed managed by this system. Also, the multiple tree layers create "ladders", permitting ground fires to spread into the crowns of the large trees. Crown fires are more destructive and more difficult to control than ground fires. Finally, the use of controlled fires to reduce the risks of large wildfires is most difficult and costly in the single-tree selection systems.

Risk of Significant Insect and Disease Infestation

Silvicultural treatments reduce risks of insect and disease damage by selecting appropriate tree species, by diversifying within and among stands, and by maintaining tree vigor. Vigor is promoted by preventing the trees and other plants from becoming too dense. Well-managed stands in all systems reduce the risk of significant pest damage. However, there are significant exceptions.

Risk of significant insect or disease damage to trees increases if the trees have been wounded. Many wounds occur during silvicultural treatments. Accidental scarring of standing trees can be caused by felling nearby trees, by bumping them with machines, or scraping by logs being pulled through the forest. Risk increases with frequency of stand treatments, particularly cutting. Cutting frequency is much higher for the single-tree selection system than for others, so the risk of significant insect and disease damage is highest.

Two serious diseases, dwarf mistletoes and some roots rots, can be difficult, costly, and in some cases, impossible to control under single-tree selection systems. Damage from these diseases is most easily controlled by managing stands as wholes. Dwarf mistletoe plants can distribute seeds within about 30

feet radius, thereby infecting nearby susceptible species. Even-aged systems allow the manager to control damage from this pest through cutting treatments.

Many root fungi infect susceptible trees by root-to-root contact. Control may require killing trees in a zone around the infected area. Uneven-aged management, particularly the single-tree selection system, can perpetuate root disease "centers" and spread infection.

Generalizations about wildlife pest damage and silvicultural systems are difficult. The major potential wildlife pests in the Region include pocket gophers, deer, and bears. These animals feed in vegetation dominated by grasses, forbs, shrubs, or tree seedlings. Use of the even-aged or group selection systems can create large areas temporarily dominated by this kind of vegetation. This can cause higher densities of potential pests, which increases the risk of significant infestation to potential crop trees. However, often the actual damage levels are not increased where this occurs.

Production of Deer and Elk Forage and Browse

Even-aged systems and the group selection system are best for deer and elk production. Grasses, forbs, and shrubs used by deer and elk occur in the greatest quantity in openings.

Protection of Archaelogical Resource

There should be no significant differences among the silvicultural systems in their risk of damage to undetected archaelogical resources. Damage depends more on the intensity and frequency of management treatments than on the kind of silvicultural system, particularly when large machines are used.

Effects on Fisheries and Wildlife Habitat

Fisheries habitat is most easily protected where the water quality is high, stream temperatures are kept moderate through shading, and were the runoff quantity is sufficient to maintain spawning areas. The single-tree selection or group selection systems are usually more advantageous than the even-aged systems for managing the vegetation in streamside management zones and riparian areas. However, the silvicultural systems used outside these zones do influence the amount of sediment in the water. (See the discussion in the section titled Risks of Adverse Effects on Watershed and Soils.)

The choice of silvicultural systems to best manage wildlife habitat depends on which species are to be emphasized. Regardless of which treatment is used in a stand, some species will benefit and others will not. Most wildlife species are adapted to thrive in specific structures and species of forest vegetation. For example, the use of the even-aged or group selection systems favors deer and elk that use herbaceous and shrubby vegetation for food. The single tree selection system may favor animals that need vertical diversity, such as spotted owls and tree squirrels.

Almost all Forest wildlife species could use a particular young-growth stand at some time in its development regardless of the silvicultural system. (The exceptions are the few species that may be totally dependent on very large, decadent trees for habitat). The kind of system would influence the proportions of species and when and how they could use the stand as habitat. A significant exception is single-tree selection management applied to large areas. The absence of large openings could prevent use by wildlife adapted to this kind of habitat, such as soaring hawks. Overall, a mix of the silvicultural systems in the forest would probably best achieve most wildlife management objectives.

DISCUSSION OF EVEN-AGED vs. UNEVEN-AGED SELECTION CRITERIA

The criteria used for selection of harvest cutting methods were developed using selection criteria identified in the Regional Guide for the Pacific Northwest Region (1984) as well as direction provided in 36 CFR 219.27(b) for management prescriptions that involve manipulation of tree cover. A brief description of the criteria follows in the next sections. These brief descriptions are intended as a guide; refer to the Regional Guide and 36 CFR 219.27(b) for more precise interpretations.

Selection Criteria From The Regional Guide

1. The selected method must permit the production of a volume of marketable trees sufficient to utilize all trees that meet utilization standards and are designated for harvest.

2. The selected method must permit use of a logging method which can remove designated trees without excessive damage to the residual stand and while meeting other established land management objectives. Figure 3-1 in the Regional Guide displays the compatibility of logging systems with common harvest cutting methods. Generally, ground based logging methods, helicopters, and cable methods using slack-pulling carriages are appropriate for all harvest methods, while cable methods without slack-pulling carriages and balloons, are appropriate only for clearcuts.

3. The selected harvest method must be capable of providing special conditions that are required to meet resource management objectives. Figure 3-2 in the Regional Guide displays commonly used harvest methods which achieve desired forest character. Generally, both even-aged and uneven-aged methods can meet desired forest character with the exception of a mosaic of forest and opening and maximum wildlife species diversity. Here, uneven-aged methods are not applicable.

4. The selected method must permit control of vegetation to established desired numbers and rates of growth of trees as well as other vegetation needed to achieve special management objectives. Figure 3-3 and 3-4 in the Regional Guide outline these harvest cutting methods. Generally, both even-aged and uneven-aged methods can be used in vegetation zones occuring on the Forest, however uneven-aged methods are not applicable for wildlife forage production or optimum tree seedling and sapling growth.

5. The selected method must promote a stand structure and species composition which minimizes serious risk from insects, disease, animal damage, and wildfire and will allow treatment of existing insect, disease and fuel conditions. Figures 3-5 in the Regional Guide displays harvest cutting methods favorable to the reduction and treatment of these agents. Generally, uneven-aged methods are not applicable where dwarf mistletoe and root disease present serious risks.

6. The selected method must meet multiple-use management objectives identified in the Regional Guide and Forest Plan.

Selection Criteria From 36 CFR 219.27(b)

The seven criteria identified in 36 CFR 219.27(b) which direct management prescriptions for the manipulation of tree cover can be summarized as follows:

1. Be best suited to multiple-use goals, considering biological, environmental, engineering, economics, and other impacts.

2. Assure that lands can be adequately restocked within 5 years of final harvest.

3. Not be chosen primarily because of the greatest dollar return or timber output, although these factors should be considered.

4. Consider the potential impacts on residual trees and adjacent stands.

5. Avoid permanent reduction of site productivity and ensure conservation of water and soil.

6. Provide the desired effects to meet special management objectives.

7. Be practical in terms of transportation and harvesting requirements and total costs of timber sale preparation, logging, and administration.

Combined Criteria For Selection Of Harvest Cutting Method

The criteria identified in the Regional Guide and in 36 CFR 219.27(b) were subsequently combined to eliminate duplication of intent and simplify the rationale for selecting the harvest cutting methods used to implement the Willamette National Forest Forest Plan. These seven combined criteria are summarized as follows:

1. The selected method must permit the production of a volume of marketable trees sufficient to utilize all trees that meet utilization standards and are designated for harvest. (Regional Guide: criterion 1)

2. Selected method must use available and acceptable logging methods. (Regional Guide: criterion 2, 36 CFR: criterion 4)

3. Selected method must be capable of meeting special management & multiple-use objectives. (Regional Guide: criteria 3 and 6, 36 CFR: criteria 1 and 6)

4. Selected method must permit control of vegetation to establish desired species composition, density, and rates of growth (Regional Guide: criterion 4, 36 CFR: criteria 4 and 6)

5. Selected method must promote a stand structure and species composition which minimizes risks from insects, disease and wildfire. (Regional Guide: criterion 5)

6. Selected method must assure that lands can be adequately restocked (36 CFR: criterion 2)

7. Selected method must be practical and economical in terms of transportation, harvesting, preparation and administration of timber sales. (36 CFR: criterion 7)

In addition selected method must not be selected primarily because it resulted in the greatest dollar return or provided the highest output of timber, or if it permanently reduces site productivity, or impairs conservation of the water and soil resources. (36 CFR: criteria 3 and 5)

RATIONALE FOR SELECTION OF HARVEST CUTTING METHOD

Timber Type Stratification Working Group

The following analysis documents the rationale for selection of harvest cutting method to be applied within each working group/management area during the life of the Forest Plan based on those combined criteria that have a significant effect on the selection. As was stated previously, the specific harvest method (clearcut, shelterwood, seedtree, group selection, or single tree selection) will be identified on a site specific basis, in accordance with direction contained in the Forest Plan, and as documented in the environmental assessment or silvicultural prescription.

Douglas fir/hemlock

This is the major working group on the Forest comprising about 80 percent of the suited acres. It covers the whole broad spectrum of site and vegetation associations within the Douglas fir and western hemlock zones of forest communities. Habitat types range from the very dry Douglas fir/oceanspray types to the cool, wet, western hemlock/devils club type along streams where Douglas fir reaches its maximum growth potential. Silver fir and noble fir are generally not present. The full range of management activities can be practiced on these sites. On the hot,dry Douglas fir climax areas, either artificial or natural shade is necessary for prompt regeneration even though Douglas fir is considered a shade intolerant species. This allows the seedlings to adjust to the harsh conditions and become established on these south facing slopes. Douglas fir is generally the dominant species and is featured in management. On selected sites, ponderosa pine, grand fir, or sugar pine may be featured. Incense cedar, western redcedar and western hemlock are minor associates.

Management Areas 10a, 11a, 11b, 11c, and 14 - Lands within these management areas will be managed for timber, roaded natural dispersed recreation, scenic modification, and wildlife habitat and forage. Satisfactory tree growth rates should be maintained. Stands should be protected from insects, disease, and damage. Both even-aged and uneven-aged methods are biologically possible.

Even-aged methods generally provide enhanced forage production and maximize wildlife species diversity (Combined Criterion 3). Even-aged methods generally provide for enhanced seedling and sapling growth rates because of the significant depressing effect of mature or larger trees on height and diameter growth of understory trees (Combined Criterion 4). For this reason, uneven-aged methods generally produce reduced timber volumes.

Dwarf mistletoe and root disease are common in many forest stands. Where they occur, uneven-aged methods are not applicable (Combined Criterion 5). Even-aged methods are more economical and practical in terms of transportation, harvesting, preparation, and administration (Burns, 1983) (Combined Criterion 7).

Use of prescribed fire may in some instances reduce fuel accumulations and eliminate undesirable competitive vegetation (Combined Criterion 4). Even-aged methods are more compatible with this treatment. Although uneven-aged methods are biologically acceptable in most healthy stands, they generally produce reduced forage for big game, reduced timber yields, increased risk of disease and wildfire, and a considerable increase in management costs and complexity. For these reasons even-aged harvest cutting methods are selected for these management areas.

Management Areas 10b, 10d, 11d, 11e, 11f, and Riparian Zones - Lands within these management areas will be managed for dispersed, motorized and non-motorized recreation; scenic retention and partial retention; and protection of riparian habitat.

Forest stands managed in these areas will maintain visual diversity through variations of stand densities and size classes. Large trees will provide an important stand component. Both even-aged and uneven-aged methods are biologically possible in disease-free stands, and can provide for the visual variety and maintenance of a large tree component. Defoliating insects, dwarf mistletoe, and root diseases are common in many forest stands. Where they occur, uneven-aged methods are not appropriate (Combined Criterion 5). The special conditions required to meet other resource management objectives may take precedence over timber volume production (Combined Criterion 3). Tree growth rates should be sufficient to produce the characteristic large tree component within the rotation age and maintain trees in a healthy condition (Combined Criterion 4). Trees should be managed to minimize risks from insects, disease, animals, and wildfire (Combined Criterion 5).

Multiple canopy stands may be more susceptible to damage by defoliating insects. For these reasons, even-aged management will generally be practiced. Uneven-aged management, primarily group selection, may be practiced where site specific analysis determines it will best meet management direction.

Douglas fir/true fir

This is much like the Douglas fir/hemlock working group except it is within the silver fir zone. Douglas fir is the dominant species and is featured in management. Noble fir is also an important associate. Western white pine may also be planted but is more commonly featured in the true fir or mountain hemlock types. The strata is cooler and generally wetter than the Douglas fir/hemlock type with snow common in the winter. This working group starts at about 3,000 feet elevation on certain slopes and aspects and probably reaches maximum area between 3,500 and 4,000 feet.

The full range of management activities are available with artificial or natural shade necessary for plantation establishment on drier south facing slopes and ridgetops.

Management Areas: The rationale for selection of harvest cutting methods is the same for each of the management areas as presented for the Douglas fir/hemlock working group, above.

True fir

This working group occupies the least area on the Forest with about three percent of the area. It occurs in the same elevation range as the Douglas fir/true fir strata but on cooler and wetter sites. Most of it lies on the rolling uplands of the High Cascades. Noble fir is the preferred management species with Douglas fir, silver fir, white pine, and Englemann spruce as minor associates. Frost can be a major hinderance to regeneration establishment and where present, shelterwood regeneration systems are used in establishing Douglas fir and noble fir regeneration.

The shelterwood overstory must be removed as soon as the seedlings outgrow the frost zone in order to minimize logging damage to the young trees. White pine and Englemann spruce are used in areas with prolonged frost conditions as they are much more frost resistant.

Although site index is lower than in the Douglas fir types, noble fir responds well to stocking level control and reserch has shown that it can produce more volume than Douglas fir on better sites. All silvicultural practices may be used where applicable.

Management Areas: The rationale for selection of harvest cutting methods is the same for each of the management areas as presented for the Douglas fir/hemlock working group, above.

Mountain Hemlock/Lodgepole Pine

This working group occupies the highest and coldest areas of our commercial Forest land. Most of it is located on the rolling land of the High Cascades. Seral species include lodgepole pine, silver fir, white pine, Englemann spruce, and noble fir. Alaska yellow cedar and Douglas fir are minor associates. The cedar tends to occur in well defined pockets. The lodgepole pine is often a pioneer species on cold, frosty sites; then silver fir and mountain hemlock come in underneath the lodgepole pine, replacing it in 60 to 80 years.

Frost is a major problem in the area. Saving young trees, obtaining natural regeneration, and the use of the shelterwood harvest system are important components of successful regeneration here. In these cold soils, all vegetation tends to occupy the same rooting zone. Root rot and Indian Paint fungus also have a high damage potential in this working group. Where either are present in the overstory, the residual hemlock and true fir are at great risk. In these cases pine should be favored, and if the risk is too high, the understory hemlock and fir should be destroyed. There is the additional tendency for trees to become established in very dense stands, which results in stagnation. Strict stocking level control is necessary to prevent this condition. Since most vegetation competes in the same root zone, vegetation immediately below tree crown height must also be considered when evaluating release opportunities, as well as that which is overtopping crop trees.

Because of the slower growth, commercial thinning must be delayed far into the rotation, and is often a borderline economic venture.

Management Areas: The rationale for selection of harvest cutting methods is the same for each of the management areas as presented for the Douglas fir/hemlock working group, above.

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APPENDIX G

MANAGEMENT REQUIREMENTS

INTRODUCTION

This appendix is included in the Final Environmental Impact Statement for the Forest Plan in response to decisions of the Chief of the Forest Service and the Deputy Assistant Secretary of Agriculture regarding appeal No. 1770, brought by the Northwest Forest Resource Council on September 18, 1986. The appeal centered on direction from the Regional Forester to incorporate "minimum management requirements" (MMRs) in forest plan alternatives. The appellant requested that the appropriateness of the MMRs be examined through the environmental impact statement process. The information in this appendix will refer to the minimum management requirements as Management Requirements or MRs and will also respond to comments about MRs that were raised during the review of the Draft Environmental Impact Statement.

A summary of Management Requirements is provided in Chapter II, "Management Requirements" section. Additional information is in Appendix B "Development of Management Requirements." The Standards and Guidelines (or specifications) for implementation of the Management Requirements are found in the Forest Plan.

This appendix addresses the issue raised by the appellant: For those management requirements which cause significant reductions in allowable sale quantity (ASQ) or present net value (PNV), alternate ways of meeting the management requirements are examined and their opportunity costs (reductions in ASQ and PNV) are compared.

Appendix H of the Draft Environmental Impact Statement, "Sensitivity Analysis for Minimum Management Requirements" has been replaced by the material presented here. The Appendix H of the Draft is part of the planning record.

BACKGROUND OF MANAGEMENT REQUIREMENTS

What are Management Requirements?

Many laws and regulations guide Forest Service activities. One law in particular, the National Forest Management Act of 1976 (NFMA), and its implementing regulations provide direction for the Forest planning process. The direction for National Forest Systems Land and Resource Management Planning, in Section 36 of the Code of Federal Regulations, Part 219 [36 CFR] specify: (1) the minimum specific management requirements to be met in accomplishing the goals and objectives of the National Forest System [36 CFR 219.27] and (2) the minimum requirements for integrating individual forest resource planning into the Forest Plan [36 CFR 219.14 through 219.26]. The term "management requirements (MRs)" will be used in this appendix to refer to these NFMA regulations instead of "minimum management requirements (MMRs) which were used in the Draft Environmental Impact Statement and Proposed Forest Plan.

Some management requirements are procedural in nature and need not be dealt with here. Some requirements were analyzed and were available for review during the Regional Guide Environmental Impact Statement process and are not dealt with here. See Appendix B for a more complete discussion. The management requirements which have not been fully dealt with elsewhere, and which require additional analysis due to significant opportunity costs associated with implementation are:

1. Maintenance of habitat to assure viable populations of fish and wildlife populations particularly mature and old growth habitat,

2. Protection of water resources, particularly water temperatures, and

3. Opening sizes limited to 60 acres or less and dispersion of created openings.

These management requirements are described in greater detail in later sections of this appendix. MRs for dead tree habitat and other requirements noted in 36 CFR 219.27 which have not been addressed in other Environmental Impact Statements do not cause significant opportunity costs (less than 2 % ASQ or PNV) when implemented.

Legal Requirements Versus Implementation Methods

The management requirements from NFMA and its implementing regulations are legal requirements. They represent "ends" which must be met during forest plan implementation. For example, the NFMA implementing regulations require that "fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." It is mandatory that, whatever implementation methods are chosen, the management requirement be met.

Specifications or standards for achievement for each management requirement are established at the national level or through analysis at the regional level for most of the management requirements. These are listed in the regulations or as Standards and Guidelines in the Regional Guide. Additional specifications identified on the Forest are listed as Standards and Guidelines in the FEIS, Appendix D, and the Land and Resource Management Plan, Chapter IV. The specifications must be based on knowledge of the resources involved. For example, in meeting the management requirement for viable populations of vertebrate species it is necessary to define the type of habitat required by the species, the maximum distance between habitats which will still provide reasonable assurance of genetic interaction, and the size of habitat area needed to support a breeding pair.

Often, the pool of scientific knowledge is insufficient to provide the entire basis for defining the specific conditions or standards that will satisfy or meet a management requirement. When this happens it is necessary to rely on the field experience and the professional judgement of knowledgeable professionals and to establish monitoring and research that will provide better information for future planning efforts.

Implementation methods are the "means" or "ways" in which the management requirements will be met. Usually there is more than one way in which a management requirement can be met. Determining the most appropriate means of meeting the specifications for each management requirement involves careful analysis at the Forest level. Considering and analyzing different means or ways of meeting a specific management requirement are particularly important if there are potentially significant reductions in present net worth (PNV) or allowable timber sale quantity (ASQ) involved.

How Implementation Methods to Meet the Management Requirements are Developed

The selection of means sufficient to meet management requirements is based on effectiveness in meeting resource protection and on minimizing reductions to PNV or ASQ. The general process used in evaluating alternative ways of meeting the management requirements is as follows:

1. Identify the desired result for each management requirement.

2. Assemble existing information about the resources addressed by the management requirement.

3. Analyze the existing information to determine what conditions or specifications need to exist on-the-ground to assure meeting the "ends" of the management requirement. (See Table G-1.)

4. Develop various ways or means to meet the management requirement. (See Table G-2.)

5. Evaluate the effectiveness of the alternative means in meeting the management requirements. Estimate the environmental effects of each set of means.

6. For each set of means, estimate the effects on economic efficiency (as measured by changes in present net value) and the effects on timber availability (as measured by allowable sale quantity).

7. Where opportunity costs of meeting a management requirement exceed 2% of PNV or ASQ of the present net value benchmark, the analysis used to select the means are presented. Two percent was used because differences less than 2% would not be significant in terms of opportunity costs of alternative means. A higher threshold would preclude evaluation of many alternatives.

For discussion purposes, opportunity costs are reductions in present net value (PNV) and reductions in allowable sale quantity (ASQ) that result from implementing resource protection measures (means or ways) to meet the management requirements set forth in NFMA regulations. In order to provide protections required by NFMA on Forest land, some opportunities to maximize present net value or to maximize timber production must be foregone.

Discussions are grouped by dispersion of created opening management requirements, water quality management requirements and wildlife management requirements in separate sections. In each section, the management requirements are displayed along with relevant specifications from national and regional guidelines, and alternative implementation methods (means or ways) are analyzed.

Table G-1 summarizes each of the management requirements (ends) subject to analysis of opportunity costs on the Forest and summarizes the specifications or standards of achievement for those ends. Table G-2 shows the alternative means considered for implementing each management requirement where the opportunity costs exceeded 2%.

Table G-1. Summary of Management Requirements and Associated Specifications.

Required Result	Summary of Specifications
Disperse created openings	Maximum created opening size of 60 acres (with some exceptions). Corners of two or more created openings may touch, but are considered a single opening and cannot exceed 60 acres (with some exceptions) if they are not stocked with trees 4.5 feet tall. Site must be adequately stocked with trees 4.5 feet tall before a harvest area is considered a closed stand and not an opening.
Protect water temperature Protect streambank stability	Meet State water quality standards. Protect streams, streambanks, shorelines, lakes, wetlands and other bodies of water.
Habitat provided that maintains viable populations of existing native and non-native vertebrate species	
- Pileated Woodpecker and Marten (*Martes americana*)	Maintain mature conifer stands (for nesting and feeding) of adequate size and distribution to permit interaction among breeding pairs of dependent species. [See Tables G-6 and G-7.]
- Northern Spotted Owl	Maintain old growth conifer stands (for nesting and feeding) of adequate size and distribution to permit interaction among breeding pairs of dependent species.

Table G-2. Summary of Alternative Means Considered for Implementing Each Management Requirement.

Management Requirements	Alternative Methods Considered
Harvest dispersion	1. For all tree species, assume 10 years to grow to 4.5 feet in height to consider an opening "closed" or no longer an opening. 2. For true fir associations, mountain hemlock and lodgepole pine (high elevation species) assume 20 years and for all other species assume 10 years to grow to 4.5 feet in height to consider as opening no longer an opening.
Protect streams and streambanks and meet water quality temperature standards	1. Set-aside all stream side vegetation (no scheduled timber harvest). 2. Selective harvest of streamside vegetation (scheduled timber harvest at 5% to 7% per decade). No harvest on potentially highly unstable streambanks (21.5% of the riparian areas).
Provide for adequate habitat to maintain viable populations of existing native and desired non-native vertebrate species	
- Pileated Woodpecker and Marten	1. Dedicate habitat sites for no timber harvest. 2. Manage habitat sites on 140-year rotations.
- Northern Spotted Owl	1. Dedicate habitat sites for no timber harvest. 2. Manage habitat sites on 300-year rotations.

In analyzing the effects of the alternative means of meeting the MRs on present net value (PNV) and allowable sale quantity (ASQ), FORPLAN analysis was done with and without constraints designed to simulate meeting the management requirement. The PNV benchmark was used for this analysis. This benchmark is a FORPLAN run which identifies the mix of management activities which would result in the highest level of economic efficiency (i.e., the highest PNV) in managing Forest resources. It also identifies the ASQ associated with the optimal mix of management activities. A benchmark was chosen to use in the with and without constraint comparison, rather than an issue-based Forest Plan alternative, because management practices necessary to meet other objectives of the issue-based alternatives may partially or fully meet the MR, thus clouding any analysis of opportunity costs induced by the management requirement.

Implementation Methods with High Opportunity Costs

Table G-3 displays the opportunity costs of the implementation methods selected for meeting management requirements on the Forest. Only those implementation measures with opportunity costs of 2% or larger ASQ or PNV are shown: dispersed openings, water quality, mature conifer (for pileated woodpecker and marten) and old-growth conifer (for spotted owl).

Implementation Methods with Low Opportunity Costs

Management requirements for other wildlife habitat requirements for threatened and endangered species, sensitive species (except spotted owl), special habitats, and dead and defective tree habitat are not addressed in this analysis because opportunity costs of providing sufficient habitat to maintain viable populations are less than 2%.

Implementation Methods that Meet More than One Management Requirement

Implementation methods selected to meet water quality management requirements also provide fish habitat in streams to assure the maintenance of viable populations of species dependent on this habitat. In addition, the water quality implementation methods meet the harvest dispersion management requirement. Alternative implementation methods for meeting water quality management requirements will also meet fish habitat requirements. No additional discussion or analysis is displayed in Appendix G for fish habitat management requirements.

Table G-3. Opportunity Cost of Meeting the Management Requirements with the Selected Implementation

Selected Implementation Method	First Decade ASQ[1] MMCF/Year (MMBF/Year)	Change in ASQ[2] Percent	PNV MM $	Change in PNV Percent
PNV Benchmark with All Protection Measures	117.3 (666.8)	--	3,788	--
Opportunity cost of Dispersed Openings	1.7 (28.4)	1	212	6
Opportunity Cost of Water Temperature and Streambank Stability	4.4 (25.7)	4	119	3
Opportunity Cost of Mature Conifer for Pileated Woodpecker and Marten	3.2 (21.8)	3	126	3
Opportunity Cost of Mature Conifer and Old Growth for Spotted Owl	10.9 (68.9)	9	455	12

[1] This comparative analysis does not include the salvable dead component in the calculation of ASQ.

[2] Percent change calculated on cubic foot basis

HARVEST DISPERSION MANAGEMENT REQUIREMENT

Source of the Harvest Dispersion Management Requirement

Direction for harvest dispersion comes from several sources. The National Forest Management Act (Section 6(g)(3)(F)) sets broad direction that the Forest Service is to, among other things, identify maximum sizes for openings created by harvest activities (created openings). This is further defined in the NFMA implementing regulations (36 CFR 219.27(d)) and in the Regional Guide for the Pacific Northwest Region (pages 3-7 and 3-8).

Specifications for the Harvest Dispersion Management Requirements

The specifications or standards for achievement of the harvest dispersion management requirement are:

1. A harvested area of commercial forest land will no longer be considered a created opening, for silvicultural purposes, when stocking surveys, carried out in accordance with Regional instructions, indicate prescribed tree stocking that is at least 4.5 feet high and free to grow.

2. The maximum size limit of harvest openings on the Forest is 60 acres. Some exceptions are permitted in specific situations.

3. Harvest openings will be separated by blocks of land that generally are adequately stocked with trees that are at least 4.5 feet high and that contain one or more logical harvest units of similar size.

4. Harvest openings that touch each other are not precluded, but will be considered a single opening in determining compliance with harvest area maximum size limits.

Alternative Ways of Meeting the Management Requirement for Harvest Dispersion

Alternative ways for meeting the specifications shown above could have been modeled in FORPLAN to simulate the required end conditions. These specifications become constraints in the model that set limits on how FORPLAN schedules timber harvest to maximize PNV. (FORPLAN constraints are discussed in the FEIS, Appendix B, "Development of Management Requirements.")

Alternatives Considered in Detail

Alternative 1: Assume that average site replanting occurs within three years of a regeneration harvest. - This modeling assumption leads to trees 4.5 feet tall being achieved, on average, 10 years after regeneration harvest for the Douglas-fir (low elevation) timber types. For the true fir associations, mountain hemlock and Lodgepole pine trees 4.5 feet tall will generally be achieved in 13 years.

Alternative 2: Assume that site replanting occurs five years after a regeneration harvest. - This alternative would slow the average achievement of trees 4.5 feet tall by two to three years because of the additional two years of regeneration lag and the increased vegetative competition. The low elevation timber types will reach 4.5 feet tall after 13 years and the high elevation areas after 15 years.

Evaluation of Implementation Methods to Meet the Dispersion Management Requirement

Either of the alternative means or implementation methods noted above would meet the management requirement but delaying the regeneration of timber stands increases the risks of plantation failure with no real benefit. No further evaluation of alternative 2 has been done. Alternative 1 was used in all Plan alternatives.

Implications for Forest Plan Alternatives

Appendix B discusses the effects of this alternative way of meeting the dispersion requirement in the FEIS alternatives. The analysis of opportunity costs of the selected means of dispersing created openings in shown in Table G-3. Predicting the opportunity cost in actual Plan alternatives is difficult because the interactions of dispersion and various standard and guideline requirements will increase the cost, while the reduction in general forest lands will decrease the cost (dispersion is only necessary in Management Area 14).

Role of Monitoring and Research

The assumption that trees will reach 4.5 feet in height in the designated times is based on extensive experience and continuing monitoring. Silvicutural practices that might change the time required to reach 4.5 feet will continue to be tested for cost effectiveness and effects on nontimber resources.

WATER QUALITY MANAGEMENT REQUIREMENTS

Source of the Water Quality Managements Requirements

The NFMA regulations require that: All management practices will ... protect streams, streambanks, shorelines, lakes, wetlands [36 CFR 219.27]. Special attention shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes and other bodies of water. This area shall correspond to at least the recognizable area dominated by the riparian vegetation. No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment shall be permitted within these areas which seriously and adversely affect water conditions or fish habitat [36 CFR 219.27(e)].

The Forest is also required to comply with the Clean Water Act (CWA), including section 208, which addresses nonpoint source pollution. In accordance with this Act the State of Oregon has established Water Quality Standards (OAR 340-41) for several water parameters, including water temperature, turbidity, and dissolved oxygen. The primary mechanisms to meet water quality standards are Best Management Practices (BMPs).

This appendix discusses the effects of meeting the NFMA management requirement to maintain streambank stability and the effects of meeting State Water Temperature standards. Practices used to meet these requirements constrain outputs of timber and PNV levels. Practices used to meet water quality standards such as turbidity do not constrain timber management practices and are not considered here.

Specifications for Streambank Stability and Water Temperature Management Requirements

The primary approach to maintaining streambank stability is to limit or prohibit timber harvesting on certain unstable streambanks. Specifications used to maintain streambank stability are included in BMPs which require that site specific conditions be assessed to determine the action needed. Field inventories indicate that 21.5 % of streambank areas are either too steep or too unstable to harvest timber without unacceptable adverse consequences.

Water Temperature specifications in OAR 340-41 state that:

> No measurable increases shall be allowed ... when stream temperatures are 58 degrees Fahrenheit or greater ... or more than two degrees Fahrenheit increase due to all sources combined when stream temperatures are 56 degrees Fahrenheit or less ...

Alternative Ways of Meeting the Management Requirements for Water Temperature and Streambank Stability

Alternative ways for the meeting specifications shown above could be modeled in FORPLAN to simulate the required end conditions. These become alternative constraints in the model that set limits on how FORPLAN schedules timber harvest to maximize PNV. (FORPLAN constraints are discussed in the FEIS, Appendix B, "Development of Management Requirements.") The following alternatives were considered:

Alternatives Considered in Detail

Alternative 1: Set-aside Shade Producing Streamside vegetation and all streambanks from scheduled timber harvest. - This alternative is designed to minimize vegetation disturbance and schedules no timber harvest in riparian areas. No shade providing vegetation would be removed by timber harvest from streambanks.

Alternative 2: Selective Harvest of Shade Producing Streamside vegetation (scheduled timber harvest) and no harvest of potentially unstable streambanks. - This alternative allows a moderate level of removal of shade producing vegetation from the riparian area. A maximum removal of 5% per decade in Class I and II and 7% per decade in Class III is allowed. Widths used for modeling purposes were 400 feet for Class I streams and 200 feet for Class II and III streams. The harvest rates are designed to maintain existing water temperatures in streams within a planning basin as regrowth of shade producing vegetation (previously removed as a result of past activities) balances removal associated with new projects. These prescriptions are applied to a basin as a whole and the expected results are viewed as a net change over time. This riparian management option is designed to produce zero net change over time. To maintain streambank stability, 21.5% of the riparian areas are removed from timber harvest scheduling. This amount was determined from field surveys of Class I, II and III streams.

Evaluation of Implementation Methods to Meet Water Quality Management Requirements

Either of the alternative means or implementation methods noted above would meet management requirements and warranted more detailed analysis.

Opportunity Costs

Table G-4 compares the PNV and ASQ opportunity costs of the alternative implementation methods for water quality protection.

Consequences of Alternative Ways or Means of Meeting Water Quality

The opportunity costs of the option of removing no vegetation from the riparian areas is approximately 2% greater than the moderate removal alternative. This alternative would go beyond meeting the requirement of protecting stream temperatures; over time, the temperature would be improved (lowered) as more shade would be provided. In those basins where past activities have removed substantial shade producing vegetation along streams, the no vegetative removal alternative could enhance fish habitat.

Table G-4. Opportunity Costs Associated with Alternative Means for Meeting the Management Requirements.

	First Decade ASQ MMCF/Year (MMBF/Year)	Change in ASQ[1] Percent	PNV MM $	Change in PNV Percent
PNV Benchmark without Riparian Protection (Baseline)	121.2 (692.5)	--	3,907	--
PNV Benchmark with MR Protection Measures (Partial Vegetative Removal, Alternative 2)	117.3 (666.8)	-3	3,788	-3
PNV Benchmark with Alternate Protection Measures (No Vegetative Removal, Alternative 1)	114.9 (653.2)	-5	3,696	-5

[1]Percent change calculated on cubic foot basis

Rationale for the Selected Implementation Means

The selected method of meeting the MR is Alternative 2 because it is less constraining on timber harvests while still providing for the minimum resource protections. By implementing Alternative 2 the Forest would meet state water quality standards throughout the planning period while minimizing PNV and ASQ opportunity costs.

Implications for Forest Plan Alternatives

FEIS Chapter II and Appendix B discuss the effects of this alternative way of meeting water quality requirements in FEIS alternatives. The analysis of opportunity costs of selected means of water quality protection shown in Table G-4 shows the maximum PNV and ASQ effects. Actual Plan alternatives will have somewhat less opportunity costs as overlaps from lands withdrawn for wildlife, scenery, recreation or other nontimber objectives will help to provide shade producing vegetation and streambank stability.

Role of Monitoring and Research

Continued monitoring will be done on water temperature fluctuations due to removal and growth of stream shade producing vegetation. See the Forest Plan monitoring program.

MANAGEMENT REQUIREMENT FOR VIABLE POPULATIONS OF EXISTING NATIVE VERTEBRATE SPECIES

Source of the Management Requirement

The NFMA regulations require that:

"Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired nonnative vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure continued existence in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area." (36 CFR 219.19).

Description of the Management Requirement

All vertebrate species in Region Six were assessed with regard to population numbers and/or distribution that could result in either Forest or Regional extinction during the next five decades. Management requirements were developed for species whose viability would be at risk if no management actions were taken to protect their habitats.

The focus was on habitats that were likely to be limiting in the future (in short supply either in total acreage or in distribution) and on identification of particular species that could be used to represent all species dependent on those habitats. This identification was done on a subregional basis, recognizing the variability of situations within the Region. Once these species were identified, the Region defined their habitat requirements and biological characteristics. The species are included in the list of Management Indicator Species (MIS) that the Forests address in forest planning and subsequent monitoring.

Table G-5 displays current Regional management requirement direction regarding limited habitats and wildlife species by sub-regional zones. The Forest is in Zone II (mountain goat not included).

Northern spotted owl, pileated woodpecker and marten (*Martes americana*) are the only species for which alternative ways of meeting management requirements are evaluated. Management requirements for threatened and endangered species, sensitive species (except spotted owl), special habitats, and dead and defective tree habitat are not addressed in this analysis because opportunity costs associated with providing sufficient habitat to maintain viable populations are less than 2%. The management requirements for fish are met with the same management practices which provide the requirements for water quality and riparian area management, therefore further analysis is not provided.

Table G-5. Species Matrix for Addressing Management Requirements for Wildlife and Threatened and Endangered Species.

Zone Habitat	Zone 1 North Coastal	Zone 2 Westside Cascades	Zone 3 Eastside Cascades	Zone 4 Blue Mountains
Mature and Old Growth (Seral Stages V and VI)	Northern Spotted Owl[1] Marten Pileated Woodpecker	Northern Spotted Owl[1] Marten Pileated Woodpecker	Northern Spotted Owl[1] Marten Pileated Woodpecker Northern three-toed Woodpecker	Marten Pileated Woodpecker Northern three-toed Woodpecker
	[1] The Final Supplemental Environmental Impact Statement and subsequent Record of Decision provide direction for management of spotted owl habitat in Region Six.			
Dead and Defective	Primary Cavity Excavators	Primary Cavity Excavators	Primary Cavity Excavators	Primary Cavity Excavators
Riparian	The Forest determined and documented as part of the planning records, whether it needed to address wildlife in addition to fish, and if so which wildlife species would represent the riparian habitat. Coordination of this process with adjacent Forests was necessary to determine consistency.			
Big Game		Mountain Goat	Mountain Goat (Wenatchee)	
Threatened and Endangered Species	Bald Eagle Peregrine Falcon Brown Pelican Aleutian Canada Goose	Bald Eagle Peregrine Falcon	Bald Eagle Peregrine Falcon Grizzly Bear Woodland Caribou (Colville)	Bald Eagle Peregrine Falcon

Habitat Needs

Once the species needing management requirements were identified, the Region defined habitat requirements and biological characteristics. These are the basis for providing habitat and also for deciding how best to represent the species' needs in the planning process and in the FORPLAN Model.

Habitat needs were defined using information from existing research whenever possible (see bibliography). This information was used to define the habitat conditions, habitat dispersal, and habitat size necessary to meet the management requirement. When information was available, but did not fit exactly the management requirement context, professional judgement was used to apply the information in estimating habitat needs. When information was not available, habitat needs were developed using professional judgment of a number of knowledgeable biologists on the subject.

Specific information on habitat needs, specifications for meeting habitat requirements, and alternative ways of meeting the management requirements for marten, pileated woodpecker, and spotted owls are presented in the following sections. For each species, information is provided for the following three habitat factors:

Principal Habitats Used

Information about the seral stages and Kuchler vegetation types which are used by the various species is documented in many research papers for individual species. Information as to which Kuchler type and/or seral stage are primary or secondary habitat, and the amount of dependency upon each habitat, is based mostly on professional judgment (Guenther and Kucera 1978, Phillips and others 1981).

Dispersal Distance Between Habitats

Usually no research information is available for optimum dispersal distance between habitats. As a result, dispersal distance is often determined on the basis of observations, experience, and professional judgment. Dispersal distance is based on the ability of an individual species to travel to the next habitat often enough to prevent isolation of sub-populations. Distances are adjusted to consider other network connections for the targeted species and overlap of habitat provided for other indicator species.

Size of Habitat Areas

The size of individual habitat areas provided for each wildlife species is based on the habitat acreage needed to support the basic social or reproductive unit of the species, i.e., breeding pairs. Both home range and species density information was used to estimate the needed size of habitat area. Professional judgement was used where no data were available for the specific habitat types being managed.

Specifications for Meeting Habitat Requirements for Pileated Woodpecker and Marten

Approximately 40-50 wildlife species are known to depend on or prefer mature conifer habitat during some part of their life cycle on the Forest. By providing a dispersion of mature conifer habitat sites for the pileated woodpecker and marten, we are assuming that the other species preferring mature conifer habitats will have adequate habitat to maintain viable populations throughout the planning period.

Regional specifications for pileated woodpecker and marten are summarized from "A Report on Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region, USDA Forest Service" (USDA Forest Service, June 1986). In developing the report, various habitat sizes and dispersal distances were considered. Based on that analysis, minimum habitat sizes and maximum dispersal distances were identified for each species. This information is based on the best available data. Alternatives which addressed changes to size or distribution were not considered in developing the Forest Plan for the Forest.

Habitat specifications for pileated woodpecker and marten are summarized in Tables G-6 and G-7.

Pileated Woodpecker Specifications

Principal Habitats Used - Pileated woodpeckers need mature or old growth forest stands for nesting, roosting, and feeding. Habitats were identified in Bull and Meslow (1977), Guenther and others (1978), and Thomas (1979).

Dispersal Distance Between Habitats - An initial five-mile maximum dispersal distance between habitats resulted from professional judgment documented in Phillips and Roberts (1985). In June of 1986, the distance between habitats was modified to one habitat area for every 12,000 to 13,000 acres (about five miles apart) to allow greater flexibility in application.

Size of Habitat Areas - The size of nesting areas in Region Six for the pileated woodpecker has been identified as a range of 100 to 540 acres. To meet the needs of pileated woodpeckers both east and west of the Cascades, 300 acres of old growth or mature timber for nesting area, plus 300 acres of feeding area was defined as a Region-wide requirement. Three hundred acres of nesting area appears to be an average for different habitats. As more data specific to westside and eastside habitats (eastside

may be further subdivided) become available, the size of the nesting area may be adjusted (Bull and Meslow 1977; Bull 1975; Mannan 1982; Mellen 1986). A 1,000 acre unit was established as the minimum size territory that a pair of woodpeckers would defend. This was determined from research data. Snag size and density were taken from Thomas (1979), and acreage figures from Bull (1975), and Bull and Meslow (1977). See Table G-6 for summary of habitat specifications.

Table G-6. Pileated Woodpecker Habitat Requirements.

	Principal Habitats Used	Dispersal Distance Between Habitats	Size of Area to which Wildlife Prescriptions Apply	Habitat Requirements to be Used in Analyses
	Zone II (West Cascades)	One habitat area for every 12,000 to 13,000 acres.	600 acres/pair	Within a 1,000-acre unit:
A.	Reproducing			Maintain 300 acres of conifers in seral stages VI and/or V, per pair for reproducing.
	Seral Stages V and VI of Kuchler types K2, K5, K6, K29, and riparian.			Maintain a minimum average of two hard snags per acre greater than or equal to 12 inches dbh within the 300 acre reproductive area.
B.	Feeding			Forty-five of these 600 snags should be greater than or equal to 20 inches dbh.
	All seral stages of Kuchler types listed for reproducing habitat, provided snags are present.			When possible, maintain reproductive area in 300 contiguous acres. If not possible, habitat may be arranged in blocks no less than 50 acres and no more than 1/4 mile apart. Maintain a minimum average of two hard snags per acre greater than or equal to 10 inches dbh on an additional 300 acres for feeding.

Marten Specifications

Principal Habitats Used - The marten (*Martes americana*) uses seral stages III-VI--closed sapling-pole, large mature, and old growth (Thomas 1979; Guenther and Kucera 1978; Phillips and others 1981). The Kuchler types used are from Guenther and Kucera (1978). The principal habitat for the marten is seral stages V and VI (mature and old growth).

Dispersal Distance Between Habitats - Burke (1982) recommends that the maximum dispersal distance between habitat areas for marten should be two miles. In 1984 the Regional Forester changed the dispersal distance from two miles to three miles because it was felt where more than one adjacent habitat is available for dispersal, the dispersal distance can be extended to three miles for marten. This change has been reviewed by a number of biologists within and outside the Forest Service and most agree that it would appear not to create a population viability problem for represented species.

In June of 1986, the dispersal distance specification for marten habitat was changed to one habitat for every 4,000 to 5,000 acres (about three miles apart) to allow greater flexibility in application.

Size of Habitat Areas - In the professional judgment of the biologists listed in Phillips and Roberts (1985), a breeding female marten can be supported on 160 acres of quality habitat. Research is variable as to the size of area needed, but the female marten home range is estimated to be 160 acres (Campbell 1979). The biologists listed in Phillips and Roberts (1985) judged that this area should be contiguous to ensure that there would be enough habitat within the home range of the female. They also judged that crown closure should equal or exceed 50% . Research papers indicate that areas with a low percent crown closure receive little or no use by marten. Therefore, to ensure an adequate crown closure, a minimum requirement of 50% closure was selected.

Table G-7. Marten Habitat Requirements.

	Principal Habitats Used	Dispersal Distance Between Habitats	Size of Area to which Wildlife Prescriptions Apply	Habitat Requirements to be Used in Analyses
	Zone II (West Cascades)	One habitat area for every 4,000 to 5,000 acres.	160 acres per habitat area. (This figure represents the territory of one female and part of the territory for a male)	Maintain 160 contiguous acres of conifer in seral stages V or VI with a crown closure 59% or greater.
A.	Reproducing			
	Seral stages V and VI of Kuchler types K2, K5, K6, K29.			Within the 160 acre unit: Maintain an average of two hard snags per acre greater than or equal to 12 inches dbh.
B.	Feeding			Twenty-four of these 320 snags should be greater than or equal to 20 inches dbh.
	Seral stages III-IV of Kuchler types listed for reproducing habitat.			Maintain a minimum average of six down logs per acre at least 12 inches dbh and 20 feet long.

Research shows that the marten requires dead and down material for foraging, cover, and denning. Six down logs/acre (Burke 1982) was selected as the minimum down material requirement. The number and size of snags required was selected to ensure that the amount of down material was achieved over time. The specifications for marten habitat are summarized in Table G-7.

Alternative Ways of Meeting the Management Requirement for Pileated Woodpecker and Marten

Habitat areas for marten and pileated woodpeckers were mapped using Regional spacing, size, and habitat suitability criteria. Marten sites are to be located every 4,000 to 5,000 acres and pileated woodpecker sites every 12,000 to 13,000 acres.

All potentially suitable forest stands located with "reserved lands" were evaluated for marten and pileated woodpecker habitat capability. Lands unsuited for timber production or allocated to meet other Management Requirements were evaluated for contributions to marten or pileated woodpecker

All potentially suitable forest stands located with "reserved lands" were evaluated for marten and pileated woodpecker habitat capability. Lands unsuited for timber production or allocated to meet other Management Requirements were evaluated for contributions to marten or pileated woodpecker habitat. Marten habitat areas and pileated habitat areas were overlapped with these resource allocations wherever possible. Designation of habitat areas specifically for marten or pileated woodpeckers occurred when habitat quality, quantity, or distribution became limiting.

Table G-8 summarizes the number of mature conifer sites for pileated woodpecker and marten. The percent unsuitable and tentatively suitable timber land is also displayed. The total habitat areas for marten include taking credit for marten habitat in pileated woodpecker, and spotted owl areas; the total for pileated woodpecker habitat areas also counts the pileated habitat in the owl areas.

Table G-8. Mature Conifer Habitat Sites.

Species	Every M Acres Distribution Requirements	Sites Non-Wilderness Sites	Percent Suitable Timber Land[1]
Marten	4-5	100	1.3
Pileated Woodpecker	12-13	38	0.8

[1]Based on 1.032 million acres of land tentatively suitable for timber production.

Once the minimum number of habitat sites was determined using Regional spacing and habitat suitability specifications, the Forest considered two options for providing mature conifer habitat. One was to dedicate the required number of acres of suitable habitat in each site. These areas would not be managed for timber production and would be expected to remain in suitable habitat condition for several decades. The second option was to manage timber stands on a larger area in order to harvest timber and produce replacement stands over time.

Alternative 1: Dedicated Sites - Under a dedicated mature conifer strategy, the required amount of mature conifer is withdrawn from timber production. Dedication of mature conifer sites has the advantage that the location of the stand does not change over time, making implementation less complicated. Dedication also assures that desired structural characteristics will be available for wildlife. There may be some risk of loss of individual stands through catastrophe.

Alternative 2: Managed Sites - This option involves the projection of long rotations on enough acres to maintain the necessary habitat through time, with all areas being rotated. The "normal" rotation age for stands in General Forest is projected to be about 75 years. Production of suitable habitat is expected to take at least 80-100 years (depending on timber type); rotations of 150 years are used to model a managed regime providing mature. This means that for every acre of suitable habitat, an additional 3-4 acres would need to be in various stages of development to provide replacement habitat.

Management of mature conifer sites assumes that existing stands can be harvested as other stands grow into a mature conifer condition to replace them. If replacement stands fail to develop desired structural characteristics (i.e., large diameter snags and down material) as predicted, mature conifer habitat would either be lost for a period of time or further delay in harvesting the existing mature conifer stands would occur.

Analysis of Opportunity Costs - The opportunity costs of designating the habitat areas (selected method) are displayed in Table G-3. The examination of opportunity costs and efficiency of the option for providing mature forest habitat through managed rotated stands is accomplished though an evaluation of per-acre timber production and economic efficiency of the possible regimes. The analysis is based on a Forest-wide evaluation, however, specific FORPLAN runs were not used to make a comparison (Forest-wide ASQ and PNV effects are not computed). This analysis has been explained in detail in Appendix B, Development of Management Requirements, and is summarized briefly here.

Consequences of the Different Ways of Meeting the Management Requirements - Populations of pileated woodpeckers and marten would not be expected to differ significantly under either alternative. Both would maintain the same amount and distribution of habitat. There are also little differences in the opportunity costs. Dedication of habitat areas would have the least impact on operational feasibility at the project level.

Rationale for the Selected Method - The Forest chose to provide mature conifer habitat by using a combination of managed and dedicated strategies on tentatively suitable timber land. This alternative achieves the desired habitat with the least effect on timber outputs. It provides opportunities to use management options where compatible with resource objectives. Both strategies are similar in their economic efficiency in meeting the management requirement. Modeling these areas as designated for this planning period does not preclude future planners from designating replacement areas as substitution opportunities can be identified (i.e., some existing pole stands could be substituted for Plan designated areas by the 5th decade). Whether areas are modeled as designated or managed, there would be little difference in implementation for the first planning period.

Implications for Forest Plan Alternatives - Plan alternatives were designed to address public issues. As a result most alternatives, including the preferred, incorporate objectives for retention of mature and old growth timber for a variety of reasons, such as wildlife, scenery, and recreation. Marten and pileated woodpecker areas overlap with areas selected for other purposes (such as unroaded recreation areas and special interest areas) wherever these sites meet habitat suitability and distribution requirements. Methods resulting in the opportunity cost shown in Table G-3 would benefit other resource uses as well.

Role of Monitoring and Research - The Forest Monitoring Plan (Forest Plan Chapter V) calls for monitoring populations and habitats of pileated woodpeckers and marten. During scheduled plan reviews, monitoring data will be considered in determining the suitability and effectiveness of the selected method for meeting the management requirement for viable populations. This will be an important test of the appropriateness of the selected modeling assumptions.

Information needs for both marten and pileated woodpecker include:

1. Dispersal distances:

    a. How far can juveniles successfully disperse?
    b. As habitat becomes increasingly fragmented, what is the ability of dispersing individuals to locate habitat islands?
    c. What effect does the size of habitat areas have on the ability of dispersing individuals to locate these sites?

2. Size of mature conifer habitat sites:

   a. Occupancy and use of habitat sites, particularly as the sites become more isolated.
   b. Reproductive success within habitat sites.
   c. Home range size in fragmented forests.

3. Utilization and reproductive success of marten and pileated woodpeckers in mature conifer sites managed on a 150 to 200 year rotations (i.e., are managed sites meeting habitat needs as compared to natural stands).

4. Population density, home range size and distribution of marten on the west slope of the Cascades in Oregon.

Specifications for Meeting the Habitat Requirements for Northern Spotted Owl

Specific Regional direction for the northern spotted owl is found in the Final Supplement to the Environmental Impact Statement (FSEIS) for an Amendment to the Pacific Northwest Regional Guide released in August 1988. In response to an appeal of the R-6 Regional Guide, the Supplement was prepared to address planning direction for spotted owl habitat management. Standards and guidelines adopted as a result of the Supplement will be used by National Forests in the Region to meet the management requirement to maintain viable populations of spotted owls.

The Final SEIS was prepared after a series of public meetings and study of the nearly 42,000 comments received on the Draft Supplement issued in the summer of 1986. A summary of the analysis of public comments, substantive comments, and copies of letters received from government agencies and elected officials can be found in Appendix I of the FSEIS.

The Forest Service Preferred Alternative (F) directs that the amount of suitable habitat at each designated SOHA will vary by physiographic province. Specific criteria were followed in locating designated SOHAs on the Willamette. Current distribution of owl habitat on lands unsuitable for timber production was evaluated for adequacy of distribution. SOHAs were designated on lands suitable for timber production only where necessary to meet distribution standards. Standards and Guidelines for the Forest Service Preferred Alternative (F) are briefly summarized in the following discussion. Chapter II of the Final Supplement should be reviewed for a detailed description of the direction. These Regional Standards and Guidelines provide specifications or standards for achievement of management requirements for northern spotted owls:

1. **Amount of suitable habitat in designated habitat areas**: Designated habitat areas shall contain the following amount of suitable habitat in the Cascade Mountain physiographic province: 1500 acres within 1.5 miles of the nest site. Habitat shall occur as one contiguous stand if possible or, as a 300 acre stand containing the known or suspected nest site with the remaining habitat as contiguous as possible. Each stand shall be larger than 60 acres.

2. **Spacing of Designated Habitat Areas**: Designate habitat areas where: greater than six miles separates areas which occur in reserved lands or in lands unsuited for timber production, and which are capable of supporting less than three breeding pairs of spotted owls; or where greater than 12 miles separates such areas capable of supporting three or more pairs.

3. **Threatened and Endangered Species**: No spotted owl habitat management activities shall adversely effect Federally listed threatened or endangered species or their habitat.

4. **Identification of Suitable Habitat**: Suitable habitat shall be identified in Forest Plans according to the general definition in the spotted owl Final Supplement and with concurrence by the Regional Forester.

5. **Management of Habitat**: Spotted owl habitat can be provided through prescriptions using even-aged or uneven-aged silvicultural systems, or no scheduled harvest. Prescriptions to be used and where they will apply shall be specified in the Forest Plans.

6. **Location of designated Habitat Areas**: Designate habitat areas only on lands suitable for timber production as needed to meet spacing standards.

7. **Priority for Locating Designated Areas**: Priority for locating designated areas follows status of occupancy by spotted owls. The highest priority is given to locations with verified occupancy by spotted owl pairs; next highest to locations with confirmed sightings of owls; lowest priority to locations where the presence or absence of owls is unknown.

The Final Supplemental Environmental Impact Statement (FSEIS) to the Regional Guide (for spotted owl habitat management guidelines) does not include the number of designated habitat areas as part of any alternative. The number of habitat areas are not specified in the Regional Guide, but will be a consequence of applying standards and guidelines in Forest Plans.

Alternative Ways of Meeting the Management requirements for Northern Spotted Owl

The Forest considered two methods for providing spotted owl habitat. One was to dedicate the required number of acres of suitable habitat in each site. These areas would not be managed for timber production and would be expected to remain in suitable spotted owl habitat over time. The second method was to manage timber stands through long rotations in order to produce replacement stands over time. The Forest chose to provide spotted owl habitat by dedicating the required amount of habitat.

Alternative 1: Dedicated Sites - Under a dedicated habitat strategy, each acre of spotted owl habitat is withdrawn from timber production. Dedication of existing stands assures that desired structural characteristics will be available, but may risk loss of individual stands through catastrophe or decay. Recent literature on old-growth suggests this risk is much less than once thought.

Alternative 2: Managed Sites - Management of sites assumes that existing old growth stands can be harvested as they are replaced by other stands that grow into an old growth condition. Delay in harvesting the existing old growth stands would occur if replacement stands fail to develop desired structural characteristics on schedule. Management of old growth on a harvest basis and replacing it removes structural characteristics important to old growth and may hasten the decline of the residual stand (Franklin 1981).

Analysis of Opportunity Costs - The opportunity costs of designating the habitat areas (selected method) are displayed in Table G-3. The examination of opportunity costs and efficiency of the option for providing mature forest habitat through managed (rotated) stands is accomplished through an evaluation of the per-acre timber production and economic efficiency of the possible regimes. The analysis summarized briefly here is similar to that described for mature forest habitat above and is explained in detail in Appendix B, Development of Management Requirements.

In general, due to the larger areas of habitat needed for spotted owls, and the longer period of time required to provide it (rotations about 200 years), it proved to be more efficient to dedicate areas for habitat. Dedicating the habitat minimizes the opportunity costs of ASQ and PNV.

The dedicated approach has the disadvantage of not managing for the vegetation characteristics needed to develop replacement habitat (composition and structure) in harvest units. As stands surrounding dedicated habitat areas become fragmented and harvested, few opportunities to replace habitat areas lost to catastrophic event would be present in the managed landscape.

Consequences of the Different Ways of Meeting the Management Requirements - Populations of spotted owls would not be expected to differ significantly under any of the options available to meet the management requirement. There are, however, differences in the opportunity costs.

Rationale for the Selected Method - The Forest chose to provide spotted owl habitat by dedicating habitat sites. This alternative maintains necessary habitat, and has the least effect on timber outputs; it is an economically efficient way of meeting the management requirement with the least opportunity costs.

The dedicated habitat approach has the advantage that the location of the habitat site does not change over time, making implementation less complicated than continuously relocating the habitat site as the stands are harvested and replaced.

Implications for Forest Plan Alternatives - Plan alternatives were designed to address public issues. As a result most alternatives, including the preferred, incorporate objectives for retention of old-growth and mature timber for a variety of reasons, such as wildlife, visual, and recreation. To the extent possible, spotted owl habitat areas overlap with areas dedicated for other purposes (such as Wilderness, unroaded recreation areas, special interest areas and other lands determined as not appropriate or unsuited for timber production), wherever these meet habitat suitability and distribution requirements. The opportunity costs shown in Table G-3 would benefit other resource uses as well. The costs do not take into account any overlap that may occur among implementation methods where lands selected for spotted owl habitat may also meet other wildlife, scenery or recreation objectives on lands suitable for timber harvest.

Role of Monitoring and Research - The Forest Monitoring Plan (Forest Plan Chapter V) calls for monitoring populations and habitats of spotted owls.

The Final Supplemental Environmental Impact Statement to the Regional Guide (Appendix D) identifies specific monitoring and research needs and describes how the information will be obtained. Intensive inventory, monitoring, and research being conducted by the Spotted Owl Research, Development, and Application Program will provide new information. This should allow an opportunity to re-evaluate and possibly adjust management direction within five years.

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APPENDIX H

BEST MANAGEMENT PRACTICES

DEFINITIONS

Nonpoint sources refers to diffuse or unconfined sources of pollution where wastes can either enter into, or be conveyed by the movement of water to, public waters (Oregon Water Quality Standards, 340-41-007(17)). Silvicultural sources, such as erosion from a harvest unit or surface erosion from a road, are considered nonpoint sources.

Best Management Practices are defined as "methods, measures, or practices selected by an agency to meet its nonpoint source control needs. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters." (40 CFR 130.2, EPA Water Quality Standards Regulation.)

Usually BMPs are applied as a **system** of practices rather than as a single practice. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility. (EPA Interagency Nonpoint Task Force, 1985.)

BMPs are basically a preventative rather than an enforcement system. BMPs are a whole management and planning system in relation to sound water quality goals, including both broad policy and site-specific prescriptions.

INTRODUCTION

Best Management Practices are the primary mechanism to enable the achievement of water quality standards. (Environmental Protection Agency, 1987.) BMPs will be selected and tailored for site-specific conditions to arrive at the project-level BMPs for the protection of water quality. The process for determining appropriate BMPs, and for ensuring their implementation at both the Forest Plan and Project level, is described. Following is a description of the methods and procedures that will be used to control or prevent nonpoint sources of pollution from resource management activities and to ensure compliance with the:

Clean Water Act of 1972, as amended (1977 and 1987)

Section 319 of the Clean Water Act Amendments of 1987 requires that the States determine those waters that will not meet the goals of the Act, to determine those nonpoint source activities that are contributing pollution, and to develop a process of determining BMPs to reduce such pollution to the "maximum extent practicable." This Appendix is designed to fulfill the intent of the requirements of Section 319.

Oregon Administrative Rules (Chapter 340-41-001-975)

Department of Environmental Quality (DEQ). Oregon's Administrative Rules contain water requirements for the protection of identified beneficial uses of water.

Memorandum of Understanding

The Oregon Department of Environmental Quality and U.S. Department of Agriculture Forest Service (2/12/79 and 12/7/82), and "Attachments A and B" referred to in this MOU (Implementation Plan for Water Quality Planning on National Forest Lands in the Pacific Northwest 12/78, and Best Management Practices for Range and Grazing Activities on Federal Lands, respectively).

The EPA has certified the Oregon Forest Practices Act as BMPs. The State of Oregon compared Forest Service practices with these State practices and concluded that Forest Service practices meet or exceed State requirements. As State practices change, comparisons are made to ascertain that Forest Service practices meet or exceed these changes. Monitoring and evaluation will determine the need for changes in BMPs and/or State standards.

Forest Service management practices will meet, as a minimum, the substantive State BMP requirements, and other considerations required by the National Forest Management Act (NFMA) and other authorities, for the protection of the soil and water resources.

The general BMPs described herein are action-initiating mechanisms which call for the development of detailed, site-specific BMP prescriptions to protect beneficial uses and meet water quality objectives. They are developed as part of the NEPA process, with interdisciplinary involvement by a team of individuals that represent several areas of professional knowledge, learning, and/or skill appropriate for the issues and concerns identified. BMPs also include such requirements as Forest Service manual direction, contract provisions, environmental documents, and Forest Plan Standards and Guidelines. Inherent in prescribing project-level management requirements is recognition of specific water quality objectives which BMPs are designed to achieve.

BMP IMPLEMENTATION PROCESS

In cooperation with the State, the primary strategy for the prevention and control of nonpoint sources is based on the implementation of BMPs determined necessary for the protection of the identified beneficial uses.

The objective is to identify the most practical means of attaining water quality objectives. Water quality objectives include water quality measures that adequately reflect the needs of identified beneficial uses.

The Forest Service Nonpoint Source Management System consists of:

1. Selection and design of BMPs based on site-specific conditions, technical, economic and institutional feasibility, and the water quality standards of those waters potentially impacted.

2. Implementation and enforcement of BMPs.

3. Monitoring to ensure that practices are correctly applied as designed.

4. Monitoring to determine the effectiveness of practices in meeting design expectations and in attaining water quality standards.

5. Evaluation of monitoring results and mitigation where necessary to minimize impacts from activities where BMPs do not perform as expected.

6. Adjustment of BMP design standards and application when it is found that beneficial uses are not being protected and water quality standards are not being achieved to the desired level. Evaluation of the appropriateness of water quality criteria to reasonably assure protection of beneficial uses. Consideration of recommending adjustment of water quality standards.

BMP Selection and Design - Step 1

Scoping

Potential concerns are identified, e.g., water quality, as part of the NEPA process for environmental analysis. Public notices are dispersed inviting comment and participation in the process. Alternatives are developed to address potential problems and to accomplish project objectives.

Environmental Analysis

Each alternative is evaluated for its potential effect on different resources, including water. From this analysis, a preferred alternative is identified, along with the measures (BMPs) needed to reduce risk and increase the potential for success.

Documentation

An Environmental Assessment (EA) or Environmental Impact Statement (EIS) is developed with a decision notice and includes required measures (BMPs).

Water quality standards are used as objectives toward which practices are designed to protect beneficial uses.

Appropriate BMPs are selected for each project by an interdisciplinary team. BMP selection and design are dictated by water quality objectives, soils, topography, geology, vegetation, climate, economics, institutional constraints, etc. Environmental effects and water quality protection options are evaluated and a range of practices is considered. A final set of practices are selected that not only protect beneficial uses, but meet other resource needs. These final selected practices constitute the BMPs.

The selected BMPs, an estimate of their effectiveness, and a plan for monitoring them is included in the project EA or EIS. The site-specific BMP prescriptions are normally included in project implementation plans, but may also be included in the body or appendix of a project environmental document.

BMP Implementation and Enforcement - Steps 2 and 3

The site-specific BMP prescriptions are taken from plan-to-ground by a combination of project layout and resource specialists (hydrologists, fish biologists, soil scientists, foresters, geologists, etc.). Final adjustments to fit the BMP prescriptions to the site are made before implementing the resource activity.

When the resource activity (e.g., timber harvest or road construction) begins, timber sale administrators, engineering representatives, resource specialists, and others ensure that the BMPs are implemented according to plan. A similar implementation process is used for other resource activities (range management, mining, etc.) on National Forests.

BMP implementation monitoring is done before, during, and after resource activity implementation. This monitoring answers the question: Did we do what we said we were going to do? Some examples of implementation monitoring for a streamside management unit BMP prescription may be:

1. **Before Project** - Check riparian areas along streams to see if layout meets the objectives of the BMP prescription, or if proposed road crossings of streams are properly located and designed per estimates made during the environmental analysis.

2. **During Project**: check to see that timber fallers understand marking prescription for timber to be felled in the riparian area. The timber sale administrator also observes on-going harvest operations to see if the activity meets the objectives defined in the project plan.

3. **After Project** - Measure canopy stream shading to see if the amount specified in the BMP prescription was retained. Monitor a beneficial use of the water to determine a change or trend in use.

Enforcement is carried out primarily through informal project reviews and contractual enforcement e.g., timber sale contract, grazing or special use permit, etc.

Contract enforcement is a more formal method used to achieve desired results. Normally, each project is assigned a person as a contracting officer. For timber sales, that person is called a timber sale administrator. The project is routinely monitored to ensure that practices are being carried out in the manner and method prescribed in the contract, permit, etc. When a contractor or permittee is not in compliance, they can be held in breach with penalties (e.g., bond forfeiture) until remedies are implemented.

Often during the course of an activity, adjustments in project methods are made if unsatisfactory results are occuring or may occur. This can often result in a contract modification (as in the case of a timber sale).

BMP Monitoring - Step 4

Once BMPs have been implemented, further monitoring is done to evaluate their effectiveness. BMP "effectiveness monitoring" answers the question: Are BMPs effectively meeting management objectives for protection of water quality?

Water quality standards are the "yardstick" against which the effectiveness is tested. If, through objective monitoring, BMPs do not meet prescribed objectives, then information is available to modify either the BMPs for future management, or the objectives, or both.

The natural variability of water quality under unmanaged conditions is an important factor that will be considered during the monitoring and evaluation. Additionally, effectiveness monitoring will include measurement against land management objectives as well as water quality objectives.

Some examples of the types of BMP effectiveness monitoring to be conducted include:

1. Measurement of stream temperatures to see if the riparian prescriptions in a watershed are maintaining water temperature.

2. Storm period surveillance monitoring of a road system to see if road rocking is effectively preventing road surface erosion.

The monitoring and evaluation section of the Forest Plan (Chapter 5) describes how monitoring of BMPs will ensure an appropriate sample size. Once a specific project is designed, a site-specific monitoring plan may be developed. Results of monitoring should be shared with State and local agencies and be made available to the public. Monitoring design, sampling, and laboratory analyses will be coordinated to ensure they are compatable.

BMP Evaluation and Adjustment - Steps 5 and 6

The technical evaluation/monitoring described above will determine how effectively BMPs protect water quality. If the evaluation indicates that water quality objectives are not being met and/or beneficial uses do not appear to be receiving adequate protection, corrective action will consider the following three components:

1. **The BMP** - Is it technically sound? Is it really best, or is there a better practice which is technically sound and feasible to implement?

2. **The Implementation Program or Processes** - Was the BMP applied entirely as designed? Was it only partially implemented? Were personnel, equipment, funds, or training lacking which resulted in inadequate or incomplete implementation?

3. **The Water Quality Standards** - Are the water quality standards realistic? They include numeric and narrative criteria that, when exceeded, are assumed to indicate detrimental impacts on beneficial uses. They are intended to provide a benchmark for evaluating harm to beneficial uses.

Assessing the applicability of the standards is a responsibility of the State. The Forest Service will provide information to the State to address the following types of questions.

- Do the standards describe the conditions necessary for protecting beneficial uses?

- Are standards higher or lower than that necessary for protecting beneficial uses?

- Do the standards reflect the natural variability occurring within the natural and human-affected ecosystem?

- Do the parameters and criteria that constitute water quality standards adequately reflect (are they sensitive enough) human-induced changes to water quality and beneficial uses?

"Validation" monitoring may be needed to make this assessment. The purpose of validation monitoring is to answer the question whether standards, coefficients, requirements, and guidelines are appropriate to meet objectives, e.g., protect beneficial uses.

Examples

1. Did the change in sedimentation impact the fish population?

2. Did the soil compaction effect tree growth?

Validation Monitoring will need to be closely coordinated with or, in some cases, conducted by research. It may require the establishment of permanent research plots or administrative studies. This kind of monitoring will be very limited and will require coordination to select projects with broad application and to prevent duplication. Only those coefficients and standards that are not reasonably validated by existing research or documentation should be candidates for this monitoring.

Corrective action may be initiated once the reason for failing to achieve the management objectives is determined. The management practice may have to be changed, the water quality objectives modified, or both.

Training

National Forest personnel involved with project location, design, layout, administration, and maintenance activities will receive BMP training. The training will consist of BMP definition and intent, as well as on the more technical aspects of planning, implementation, monitoring, and evaluation.

GENERAL BEST MANAGEMENT PRACTICES

Individual, general Best Management Practices are described in *General Water Quality Best Management Practices*, Pacific Northwest Region, 11/88. This provides guidance, but is not a direction document. Also included in this document is a description of the process, and limitations and use of these BMPs. Each BMP listed includes the Title, Objectives, Explanation, Implementation and Responsibility, and Monitoring. Evaluations of ability to implement and estimated effectiveness are made at the project level.

Example:

General BMP T-5.

Title - Limiting the Operating Period of Timber Sale Activities.

Objective - To ensure that the Purchaser conducts operations in a timely manner, within the time period specified in the Timber Sale Contract (TSC).

Explanation - The TSC specifies a Normal Operating Season, during which, operations may generally proceed without resource damage. Operations are permitted outside the Normal Operating Season only when they can be conducted without damage to soil, water, and other resources. Where determined to be necessary through the environmental analysis, the TSC will limit operations to specific periods or weather conditions. Operations are not permitted to continue if damage will occur.

Implementation & Responsibility - Limited operating periods are identified and recommended during the Timber Sale Planning Process by the interdisciplinary team and followed through the life of the timber sale primarily by the Sale Administrator.

Ability to implement - Add at project level.

Effectiveness - Add at project level.

Monitoring - During implementation of timber sale activities by the Sale Administrator, Forest Service Representative (FSR), engineers, and watershed specialists. Also see Forest Plan monitoring plan, Chapter 5, monitoring plan item: Water Resource Monitoring.

SPECIFIC BEST MANAGEMENT PRACTICES

Not all of the general BMPs listed will normally apply to a given project, and there may be specific BMPs which are not represented by a general BMP in this document. These specific BMPs are the Standards and Guidelines listed in Chapter IV of the Forest Plan and Appendix D of the FEIS.

The sensitivity of the project determines the need for the specific BMP prescriptions in the EA/EIS or in the sale/project plan, or in the analysis files.

APPENDIX I

ANALYSIS OF PUBLIC RESPONSE

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APPENDIX I

ANALYSIS OF PUBLIC RESPONSE

INTRODUCTION

This Appendix presents or discusses the:

- Release and distribution of the Draft Environmental Impact Statement (DEIS).
- Summary of the public comment (including the process used to review the comments which were received, an overview of the distribution of the comments, and an overview of the content of the comments).
- Response to public comment.
- List of Who Commented.
- Agency, Elected Official, and Indian Tribe Comments (Letters from Public Agencies)

The Forest took the public comments very seriously. They provided a unique and invaluable opportunity to learn and consider the personal, professional, and organizational opinions of those affected by the management of this Forest. A diverse cross section of opinion was tapped over a range of issues as diverse as the natural resources found on the Forest.

Over 17,500 comments were received. Very many of them were personally read by the Forest Supervisor, the Deputy Forest Supervisor, the District Rangers, and the Staff. They were considered by the Interdisciplinary Planning Team, by program managers, and by those responsible for implementation on the ground. All were analyzed for their content and the valuable perspectives they offered on management of this Forest.

RELEASE AND DISTRIBUTION TO THE PUBLIC

The DEIS and Proposed Land and Resource Management Plan (Draft Forest Plan) received wide notice and distribution. A news conference was held on December 7, 1987 for the print and electronic media. Distribution began on that day and continued through December and into January, 1988. Notice was published in the Federal Register on December 24, 1987. The initial public review period was scheduled to end March 31, 1988. It was later extended to May 16, 1988.

Over 5100 Summary Packets were distributed. The Summary Packets included a summary, maps, and a response form. 1850 full sets of the DEIS, Appendices, Draft Forest Plan, maps, and response forms were distributed. Several thousand introductory summary brochures were also circulated.

The Forest publicized the availablity of the DEIS and Draft Forest Plan and actively encouraged public involvement throughout the comment period. Display ads were printed in newspapers in Eugene, Salem, Albany, Corvallis, and Oakridge. Three Planners Reports were published and distributed to the 2200 names on the Planning Mailing List.

Numerous open houses, displays, and presentations were conducted during the comment period. These activities both informed the public of the availability of the documents and provided the opportunity to answer questions. Open houses were held not only in Eugene, Salem, and Albany, but in several smaller communities near the Forest. Displays at various locations and events in Portland, Corvallis, and Eugene helped publicize the nature and availability of the documents to the general public. Planners responded to telephone calls and office visits. They conducted internal briefings for employees and retirees to draw upon their familiarity with the Forest's resources. They also participated in numerous meetings of service clubs, business and professional groups, recreation and conservation groups, and briefed various agency and elected officials.

The print and electronic media provided excellent coverage of the availability of the documents, the public's opportunity to comment, and of the major public issues associated with the planning process. In addition, some organizations independently undertook their own campaigns to inform the public of the opportunity to comment.

SUMMARY OF PUBLIC COMMENT

Content Analysis Process

Great emphasis was placed on reviewing the public comments. The Forest attempted to capture the feelings, opinions, ideas, suggestions, and supporting logic offered by the many people and organizations that devoted their energies to commenting on the DEIS. A technique called "content analysis" was used to accomplish this. Obviously, any process used to interpret and catalog the expressions of others is subject to inherent limitations; and content analysis and its accompanying coding are no exception. The Forest made every effort to minimize those limitations, however, and to capture the thrust of the comments as completely and objectively as possible.

Upon arrival at the Supervisor's Office, each comment was date stamped and assigned a sequential number. The comment was copied onto larger working sheets, and the original put in a secure place.

In order to make analysis manageable, each comment was coded to the extent practicable for basic demographic information and for content. Demographic information normally included the identification number of the comment, the name and address of the person commenting, and the form of the response (e.g. form letter, petition, original letter).

Content coding was of course more challenging. A code book was established shortly before the completion of the comment period which attempted to categorize the reasons or concerns expressed by the comments. The code book was continually refined as coders were trained and gained experience coding actual comments. Ultimately codes were available to capture opinions and information on most recurring subjects and specific sites. In addition, coders could "red flag" technical information, comments, questions, or ideas, signaling the data entry team that the specific verbatim comment should be entered into a data base.

The coders included Forest Service retirees and employees from a number of different Ranger Districts and Forests. These individuals represented a range of backgrounds and carried a collective familiarity with the full range of major public forest management issues. Data input of the coded comments was generally done by contracted temporary services.

Comments were read by the coder at least three times. The first reading was intended to provide context and give the coder an overall sensitivity for the writer's concerns. In the second reading, the coder selected comments that were relevant to the identified issues and expressed the writer's feelings. The third reading provided the opportunity for numbering and categorizing the comments. This last step could include highlighting textual excerpts as needed (e.g. existing subject and opinion codes were inadequate, a potentially substantive comment was made, technical information was provided). The coded comment was then forwarded to a coding supervisor for review before the data entry phase was approved.

Distribution of the Comments

It is highly unlikely that the people and organizations who chose to comment on the DEIS and Draft Forest Plan constituted a truly random sample of the public. Consequently some basic analysis of the sample was undertaken to provide managers and the Interdisciplinary Team (IDT) a measure of context in which to interpret the viewpoints represented by the comments. The analysis of the sample was not intended to meet rigorous statistical standards, nor was it used as a basis from which to draw sophisticated inferences. In fact, nearly 900 comments were not analyzed for distribution at all, because they came from unidentifiable sources (illegible name, missing address, etc.). These 900 comments were analyzed only for content.

Readers are cautioned that the numbers presented in this section are approximate only. Specific numbers should not be assumed to suggest absolute precision. Readers are encouraged to use the information only for purposes of establishing context for the viewpoints represented by the comments.

Who

Over 17,500 comments were received. About 600 of these involved a person or organization sending in more than one response, including raising new concerns ("duplicates").

These comments involved over 177,000 separate thoughts, ideas, or concerns.

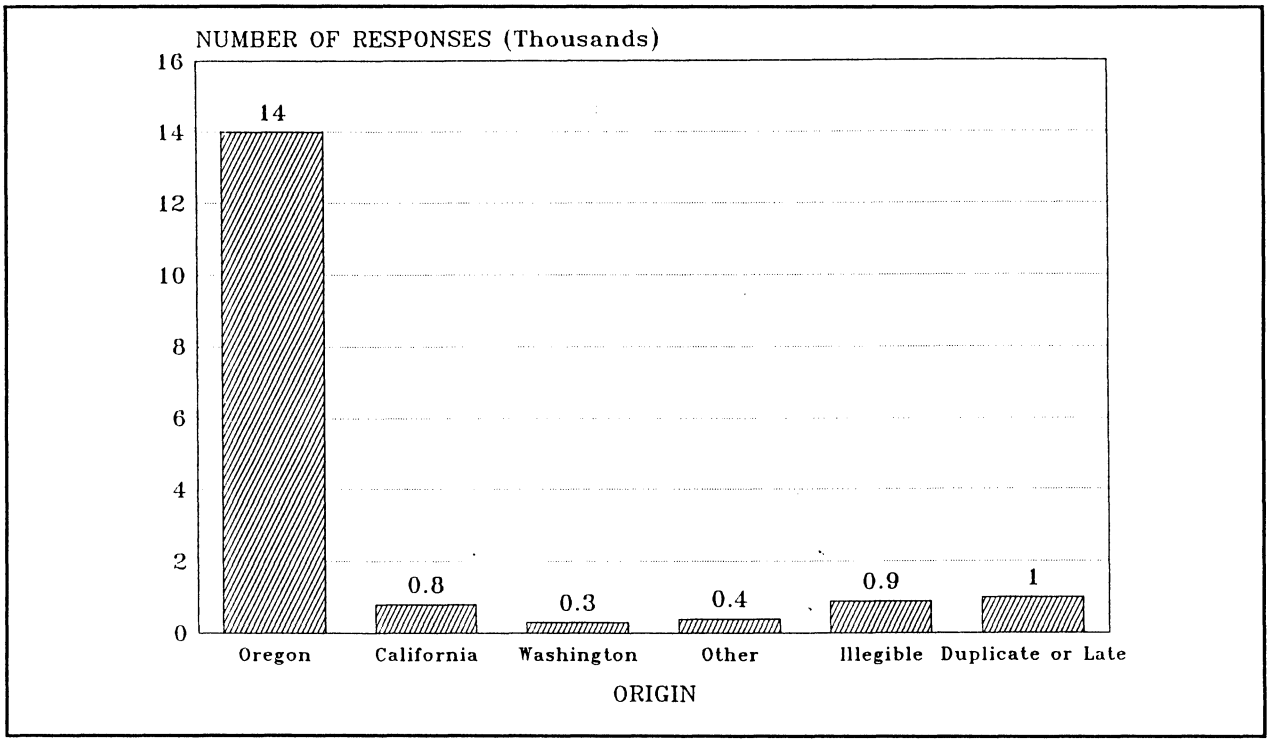
The vast majority of the comments, about 16,000, were submitted by individuals acting for themselves or families. The remaining comments came from a variety of sources, such as business, timber industry, environmental and conservation groups, recreation groups, public agencies, elected officials, universities, and professional groups. No Native American tribal council comments were received.

Where

Comments were received from nearly every State. Comments were also received from Australia, Brazil, Canada, Finland, the Sultanate of Oman, Sweden, and West Germany.

The overwhelming majority of comments (in excess of 14,000) were received from Oregon. About 750 comments were received from California, and about 350 were received from Washington. See Figure I-1.

Figure I-1. Geographic Origin of Comments



Comments were received from about 300 Oregon cities, from Adel to Zigzag. In fact, Oregon cities beginning with every letter of the alphabet except Q and X were represented.

Oregon cities contributing in excess of 100 comments were:

4,280 - Eugene
1,142 - Springfield
726 - Lebanon
619 - Portland
574 - Salem
525 - Corvallis
500 - Cottage Grove
480 - Sweet Home
399 - Albany
346 - Creswell
267 - Stayton
246 - Oakridge
186 - Mill City
169 - Roseburg
162 - Lyons
149 - Scio
145 - Dallas
129 - Veneta
125 - Florence
124 - Junction City
105 - Drain

Form

The vast majority of comments, about 14,000, were submitted on one of several preprinted forms prepared by interested organizations. Broadly speaking, these organizations either supported the interests of the timber industry or various conservation/preservation groups.

Over 2,000 original letters and cards were received. Only about 150 comments were submitted on the form supplied by the Willamette National Forest. Some comments were received in other formats, ranging from petitions to resolutions to extensive critiques in excess of 50 pages.

Some people believed that the value of the form letters should be discounted. Some of the more frequently expressed concerns were that:

- Using the forms perhaps indicated that the person commenting did not feel as strongly about the issues as people who devoted the energy to write a personal letter.
- The matters expressed in such comments more nearly reflected the opinion of the interest group producing the form than that of the individual submitting the comment.
- In some cases real or perceived employment or organizational coercian motivated the writer to submit the form, rather than personal agreement with the content of what was submitted.
- Form letter campaigns represented efforts on the part of the interest group producing the form "to stuff the ballot box" in favor of that group's positions.

Despite the fact some people held these concerns, the Forest coded and considered comments regardless of the form in which they were received. The Forest's philosophy is that content is more important than the manner of presentation, whether by backside of an envelope, handwritten letter, preprinted form, or glossy graphic.

To the extent the use of preprinted forms may have stimulated wider public participation in the planning process, the public benefited from a more informed final decision about the management of the Forest. While the extent of this stimulation cannot be measured directly, one fact is clear: collectively the forms provided by the interest groups were much more heavily used than the one provided by the Forest's mailing.

Concerns about "stuffing the ballot box" should not be overemphasized, because neither the National Environmental Policy Act (NEPA) nor the National Forest Management Act (NFMA) contemplate that decisions affecting the forest environment will be made by simple popular vote. The degree of public interest surrounding specific issues, as judged either by their extent or intensity, is only one important factor the Deciding Official evaluates in making an informed decision. Many other factors, such as legal requirements, available technology, and resource capability also influence the decision. Indeed, the bulk of the FEIS and related documents analyzes and addresses these other factors.

Finally, the Forest is unaware of extensive concern about coercian in the submission of form letters. In considering this issue it is important to keep in mind that the perception of coercian is a highly individual matter. It is certainly possible that some people may have felt they were coerced into submitting their comments, while others holding nearly identical opinions in nearly identical circumstances might not have felt any such compulsion. That the issue of coercian was not pervasively raised is perhaps the best evidence that it was not a substantial factor. Furthermore, the ultimate effects of coercian (if any occured) would merely be a variation of the "stuffing the ballot box" concern discussed above.

Overview of Comment Content

This subsection provides a subjective overview of the comments received on the DEIS alternatives and selected major issues.

Comments on the Alternatives

Many of the comments referred to the DEIS and accompanying documents in general terms rather than identifying a specific alternative.

Of the alternatives specifically mentioned, Alternative J received the most comments. Most likely this is because it was identified as the Preferred Alternative and was the subject of the Draft Forest Plan. The overwhelming sentiment (over 44,000 comments) was that modification was necessary. In addition, over 18,000 comments expressed dissatisfaction with Alternative J, while less than 800 approved of it.

The Oregon Natural Resources Council (ONRC) and Willamette Forestry Council (WFC) Alternatives each received over 19,000 favorable comments. The ONRC and WFC positions were in many respects incompatible; but despite such incompatibilities, each received only a handful of negative comments. Most of the comments expressing support for these positions were found in the text of preprinted cards.

Alternative C received over 3,500 favorable comments. Of all the fully displayed alternatives, Alternative C was closest to the ONRC Alternative. Many expressed their support for Alternative C, based on the fact that the ONRC Alternative was eliminated from detailed study.

None of the remaining alternatives received extensive comment.

Table I-1 displays the distribution of comments and opinions on the alternatives. The numbers are approximate only. Specific numbers should not be assumed to suggest precision.

Table I-1. Comments and Opinions on Alternatives (I-1)

Alternative	Positive	Negative	No or Other Opinion	Modification Necessary	Total
In General	392	160	69,280	63	69,895
NC (No Change)	49	20	5	1	75
A (No Action)	20	21	13	1	55
B-Dep (RPA)	26	21	4	14	65
C	3,555	47	85	347	4,034
D	163	10	12	24	208
F	72	16	17	19	124
I	24	20	0	6	50
J (Preferred)	784	18,808	305	44,075	63,972
J-Departure	17	19	4	26	66
ONRC	19,107	32	57	86	19,282
WFC-Willamette Multiple Use	19,324	55	45	114	19,438
NEW ALT.	356	1	63	0	420
OTHER PLANS	13	1	2	1	17
TOTAL					177,701

Comments on Selected Issues

Dispersed Recreation: The comments expressed support for an improved trail system on the Forest, including both new construction and maintenance of existing trails to a higher standard. Most comments about ORV use were negative, citing resource damage and incompatibility with many other forms of disperse recreation. Many comments were site-specific, encouraging management consistent with the writer's preferred use of the sites.

Old Growth: Many writers expressed their interest in preserving most or all of the remaining old growth. Generally the reasons which were cited were difficult to value economically: aesthetic, ecosystem integrity, habitat needs for plants and wildlife, biological diversity, protection of soil and water, recreational uses, and spiritual values.

A smaller, but still sizable group of people pointed to the economic value of harvesting old growth and expressed concerns for local economies and mills should remaining old growth be extensively preserved. Many in this group found beauty and biological value to converting stands of "decadent" timber to more vigorously growing second growth forests.

Many people on both sides of the old growth preservation issue questioned the definition and inventory figures for old growth used by the Forest. Many also considered the Forest's practice of grouping old growth with mature timber misleading.

Roadless Lands: People were highly polarized over the issue of whether to develop roadless lands, and the extent to which this should happen. A large number of people considered the roadless issue closed with the passage of the Oregon Wilderness Act of 1984. They favored development of most or all of the remaining roadless lands. Several considered any no-harvest allocations adjacent to existing wilderness as constituting improper buffers to wilderness.

Others strongly objected to building any roads into existing roadless lands; and frequently people objected to any entry for timber harvest, even if it involved no new roads. Reasons stated for retention of some or all of existing roadless areas included ecological integrity, retaining options for future wilderness designation, unroaded recreational use, promoting biological diversity, and preservation of remaining old-growth stands.

Scenic Quality: Most comments about scenic quality were concerned with the visual aesthetics from major roads and highways and from other important scenic corridors. The impressions of Forest visitors and tourists, with the resultant effects on tourism, were important. Many considered the Forest's treatment of the visual resource misleading, inaccurate, or without adequate integration. Others criticized the technical timber volume treatment of visual areas. Some stressed the relatively temporary nature to the disruption of the visual resource that logging produced, and therefore felt the Forest had overemphasized visual considerations.

Timber: Most people had something to say about timber management practices. The concerns ranged from the amount of harvest to the nature of logging techniques, rotation lengths, reforestation, land suitability, effects of logging on other resource values, and the way in which available timber quantities are calculated.

Many people saw the economic well being of themselves, their family, and their community tied to a high, sustainable level of timber supply. Frequently this included the availability of old growth and the need to enter areas currently in roadless condition. Frequently this included issues of cost efficiency in the logging techniques employed.

Others viewed the effects of timber harvest as seriously harmful to virtually all the remaining resource values in the Forest. The issue was joined across the full range of harvest considerations, from land suitability to logging techniques and vegetation management. Economic concerns were often addressed in terms of the need for diversification.

Virtually no one perceived their own historical or anticipated use of the timber resource inconsistent with wise forest management or conservation principles. Yet often comments would characterize the position of the "other side" as economically harmful, wasteful, or exploitive. In all its facets this issue clearly represented a matter in which the public was seriously divided.

Despite the complexity of the questions and their interrelationships to other resources, an extremely sophisticated level of public debate was evident in the comments on timber.

Water Quality and Quantity: Serious concerns were raised about the Forest's treatment of water quality and quantity, including related issues such as soils and the management of riparian zones. In short, the general comment was that the Preferred Alternative would fail to result in compliance with

applicable laws. Considerable attention was focused on the adequacy of standards and guidelines and monitoring plans.

Wildlife, Fish, and Plant Habitat: Most of the comments expressing concern for fish habitat were related to the water quality issues discussed above. Similarly, the most pervasive concern for plant habitat involved another subject discussed above, namely old growth.

The bulk of the comment about wildlife involved management indicator species (MISs), such as the spotted owl, pine marten, pileated woodpecker, and big game. Some questioned the process by which MISs were chosen and Management Requirements (MRs) were set. Disagreement was evident over whether too much or too little protection was provided. The economic impact and the state of scientific knowledge were thoroughly debated by the comments.

Wild and Scenic Rivers: Several people requested that the Forest conduct further evaluation and designation of rivers under State Scenic Waterways or federal Wild and Scenic River legislation.

Economics: Concern about the economic impact of potential management decisions was evident throughout the comments. Typically the concerns centered around the extent to which proposed management practices might result in lower timber harvest volumes or more expensive mitigation requirements.

The debate ranged over virtually every consideration: would economic well being be enhanced or devastated; who would be affected and when; how were assumptions formulated; were assumptions valid; were analytical techniques appropriate; were alternative techniques available to achieve the desired resource effects with less economic impact; could changes in practices be phased in; what was the proper role of the Willamette National Forest in supporting the local economy? Frequently the debate was simply social: assuming economic cost was involved in protecting the environment, just how much economic cost was the public willing to incur?

RESPONSE TO PUBLIC COMMENT

Introduction

One of the most valuable advantages to circulating the DEIS and receiving back comments from the public was the opportunity to receive substantive comments. A substantive comment is defined by Forest Service Handbook 1909.15, Section 05, Item 34 as, "A comment that provides factual information, professional opinion, or informed judgment germane to the action being proposed."

Consideration of substantive comments gives the Forest the opportunity to do one or more of the following:

- Modify alternatives, including the proposed action.
- Develop and evaluate alternatives not previously given serious consideration.
- Supplement, improve, or modify the analysis.
- Correct factual errors.
- Identify where in the documents the comment is addressed, and as appropriate explain why the Forest's position is maintained in the FEIS by discussing the rationale, sources, and authorities used.
- Explain what circumstances would trigger agency reappraisal or further response.

Each of these results should produce either a better technical document, promote public understanding of the issues, or both.

Identification of the substantive comments was a task undertaken by the Interdisciplinary Team. The substantive comments, and the Forest's response, are presented below. Comments are arranged by subject categories. In many instances comments have been paraphrased or combined when issues of a like or closely related nature are involved.

Air Quality

In light of the heightened public awareness and sensitivity to the issue of air pollution, the Draft Forest Plan is overly optimistic for the levels of prescribed burning that are projected. What are the impacts if you are unable to use prescribed burning to reduce logging slash at the rate your plan suggests?

> **Response:** If air quality considerations become more restrictive for prescribed burning, the result will likely be a reduction in the amount of area treated by that method. A corresponding increase in fire hazard and increased difficulty in reforestation on some sites may result. These results may be ameliorated to the extent alternative forms of fuels treatment may be prescribed which minimize the production of smoke during critical times of the year. The physical removal of large amounts of residue is not likely to be physically or economically practical. In addition, in some cases there is the need to retain large woody material for long-term productivity.

The DEIS states that emissions will be decreasing from the 1979-1985 average, but no reference is made to the 1976-1979 baseline emissions. Planned increases require technical analysis on nearby Class I wilderness and Class II lands (analysis unneeded if the baseline period is not exceeded). If significant impacts are indicated, then specific measures designed to mitigate them must be described.

> **Response:** The FEIS has been corrected to incorporate the 1976-1979 baseline period emissions. If projections or monitoring information reveals that baseline emissions may be exceeded, the technical analysis will be completed in accordance with the State Implementation Plan.

Oregon Administrative Rule 340-20-001 requires the highest/best practicable treatment and control be applied to pollution sources. Since prescribed burning smoke is the largest source of fine particulate emissions in the State, the DEIS should include consideration of an alternative that assures the highest/best practicable treatment of forest residues, focusing on intensive utilization of woody residues for industrial purposes.

> **Response:** The Forest must comply with the Clean Air Act under all alternatives. The State Department of Environmental Quality's (DEQ's) State Implementation Plan (SIP), of which the Smoke Management Plan administered by the Oregon Department of Forestry (ODF) is a part, establishes the standards which must be met. The SIP goal is a 50% reduction in the fine particulates from the 1976-1979 baseline by the year 2000. In order to meet this goal, alternative treatment methods and strategies for the disposal of forest residues are considered in the site-specific project analyses for activities which propose generating or disposing of such residues. In this way highest/best practicable treatments and controls are identified, including potential industrial uses.

Page IV-41 of the DEIS notes that "no emissions from forestry burning have yet been identified by the Environmental Protection Agency (EPA) as hazardous to human health." While technically true, this statement is misleading and in conflict with other Forest Service FEISs. The EPA does not categorize

health effects of pollutants in terms of sources. Rather, they are categorized in terms of the pollutants themselves, including carbon monoxide, particulates, and toxic air pollutants from a variety of sources. The FEIS should more accurately reflect what is known, or not known, about the health effects of smoke.

Response: While it is known that the burning of woody material does produce some volume of respirable particulates, there is no completed study as yet detailing the health effects of smoke produced from forestry burning. In terms of health effects of smoke in population centers, residential woodburning is presently the primary concern of air regulatory agencies.

The information present on pages III-33 through 37 and IV-46 through 47 of the DEIS is outdated. In particular, the discussion describing the Oregon Smoke Management Plan should be revised.

Response: Updated information is incorporated in the FEIS. A discussion of the visibility portion of the State Implementation Plan has been added, outlining the restriction of forestry burning in the Cascades between July 4 and Labor Day. The Figure showing the areas of air quality concern in Chapter III has been updated to include Bend as a Designated Area. The Figure showing acres treated by prescribed burning is updated. The discussion about intensive utilization practices has been updated to reflect more current economic factors and the retention of woody material on sites for nutrient supply and long-term productivity.

Page 17 of the DEIS Summary states: "For the use of prescribed fire, extreme care will be taken to avoid intrusion of smoke into State-identified sensitive areas." What area in this state, or in any state, is not a sensitive area in regard to the toxic effects of smoke, especially smoke containing toxic chemicals such as herbicides?

Response: The State Smoke Management Plan which is a part of the State Department of Environmental Quality's State Implementation Plan establishes which areas are considered "sensitive" and what standards must be met.

The instances in which the same unit would be treated by both herbicides and burning are expected to be very rare during the planning period. Normally this would only occur when there were serious, unexpected problems in restocking the unit, and even then the normal order would be to burn first and then apply the herbicide. In the unlikely event the order would be reversed (i.e., burning after the application of herbicides) the site specific environmental analysis would carefully consider the potential health effects of the procedure.

Diversity

The discussion about the Basis for Alternative Development (pages II-3 and II-4 of the DEIS) fails to list the need to develop an alternative which looks to maintain an adequate level of natural forest diversity as required by regulation. See 16 USC 1604(g)(3)(b) requiring plans to provide for plant and animal diversity; and other citations relating to diversity such as 36 CFR 219.26, 36 CFR 219.27(g), and the Regional Guide standard and guideline 2. The diversity provided by SIAs, RNAs, and wilderness fails to provide adequate distribution and representation of all habitats; and the result will be a timber harvest schedule, eventually excluding stand ages between 100 and 300-400+ years.

Response: Alternatives are intended to represent differing integrated strategies to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process. Consistent with National Environmental Policy Act and

National Forest Management Act requirements, a broad range of reasonable alternatives, including certain specified ones, must be formulated. A "diversity" alternative, as such, is not one of these.

While no "diversity" alternative must be formulated, in fact all alternatives consider diversity and no alternative proposes the loss of a viable, well-distributed native or desirable nonnative species of plant or animal. No type conversion is proposed. With the exception of the NC Alternative, all alternatives meet the requirements of the Regional Guide.

The Final Forest Plan includes substantial direction to maintain diversity. Examples include: using management indicator species to provide appropriate habitat protection for the various wildlife species; management sensitivity to corridor needs for species dispersion; management for sensitive plants and for threatened and endangered wildlife species; retention of timber stand structural diversity (green trees, snags, down wood) in harvest areas; management for old growth in reserved areas and in general forest; and some management areas managed on extended rotation ages.

The Goals Statement for Alternative C on page II-48 of the DEIS says that "...diversity of plant and animal habitats will be maintained at high levels." What does that mean?

Response: In addition to meeting the minimum legal requirements for plant and animal diversity, a specific goal of Alternative C is to actively foster diversity as a prime consideration in project planning. Alternative C, as with all alternatives, provides for viability for all of the species, but different alternatives place varying emphasis on the relative populations for which species are managed.

The terms "plant diversity" and "animal diversity" are misused at page III-47 and Figure III-G-4 of the DEIS. If they imply species numbers then the term "species richness" should be used. Richness is only a part of diversity. Similarly, the opening discussion about the environmental consequences to vegetation (DEIS, page IV-49) seems too narrow. It inadequately discusses the complexity of ecosystems (genetic, temporal, structural) and the manner in which resource uses can be coordinated. Nor is there any method to monitor biological diversity.

Response: Diversity can occur at the genetic, species, habitat and landscape levels. Species diversity consists of species richness (the number of species present) and species evenness (the relative population density of the species present). See the Vegetation Section, Chapter IV of the FEIS.

It would be virtually impossible to conduct a complete census of the vertebrate and plant species in order to calculate species diversity over an area the size of the Forest. The most feasible and useful approach has therefore been to monitor specific species (Management Indicator Species and threatened/endangered species), and then conduct planning and monitoring for the habitat used by all other species. "Habitat" in this context can be thought of as the abundance, distribution, structural condition, and seral stage of plant communities across the Forest. The Final Forest Plan accordingly calls for emphasis on specific species and management for the habitat of all other species, along with associated monitoring activities. This method inherently incorporates the concept of resource use coordination.

The Draft Forest Plan fails to describe diversity as a component of the desired future condition of the Forest in 10 to 15 years.

Response: The Final Forest Plan Goals recognize the vital role that diversity plays in a healthy and productive forest ecosystem. The most important facet of this recognition, the direction to manage in a manner consistent with promoting diversity, is found in the standards and guidelines (S&Gs) in Chapter IV of the Final Forest Plan and the monitoring plan in Chapter V of the Final Forest Plan. The future condition of the Forest will reflect the success of those S&Gs.

Old-growth values and quantities are not addressed in the DEIS and Draft Forest Plan in terms of forest type. An abundance of old forest stands do and will continue to exist in the wilderness areas, but a large majority of these stands are high elevation true fir and mountain hemlock forests which do not offer the structural and biologic diversity that the lower elevation douglas-fir/western hemlock forests do.

Response: As a result of the Mature and Over-Mature Survey, displays of old growth by species and land allocation are presented for the Forest in Chapter III of the FEIS and for each alternative in Chapter IV of the FEIS. The direction in the standards and guidelines for the Final Forest Plan do not make a distinction for old growth by species. If monitoring results reveal that species or elevation specific direction for old growth is indicated, then the appropriate changes will be made.

Why is no dollar value assigned to the long term benefits of ecological diversity?

Response: The long term benefits of diversity are very difficult to quantify in economic terms. They contribute to the ability of the Forest to provide a full range of commodities and amenities, but the economic impacts of changes in diversity depend on the exact nature and degree of change and cannot yet be predicted with confidence.

In order to "provide forest visitors...the experience of...natural aspects of the forest" as promised in the fourth item to Recreation in Chapter IV of the Draft Forest Plan, it will be necessary to maintain some examples of the complex ecological diversity, especially for future generations.

Response: Complex ecological diversity will be maintained over much of the Forest. Wilderness, riparian areas, old-growth groves, special management areas, and areas of unsuited soils will all retain their complex, natural characters. In addition, a complex set of seral stages, stand structures (green trees, snags and down wood), and dispersal corridors will occur in lands managed for timber.

Figure III-G-4 of the DEIS fails to portray the entire picture of natural diversity by omitting nonforested communities and the patterning of communities and successional stages across the National Forest.

Response: Figure III-G-4 was only intended to refer to conditions in forested stands or disturbed areas that are quickly becoming reforested. Natural openings and nonforested lands also contribute a tremendous amount to the diversity of the Forest. Similarly, spatial diversity (the distribution of plant communities across the landscape) also contributes to habitat diversity beyond the changes in succession depicted in that Figure.

The diversity discussion starting on page IV-51 of the DEIS brings up the issues of fragmentation and patch size, but it does not offer any evaluation of the alternatives on these critical issues.

Response: The vegetation section of Chapter IV of the FEIS discusses fragmentation and patch size, and the standards and guidelines in Chapter IV of the Final Forest Plan provide direction that patch size and fragmentation be considered when proposing timber harvest. No

comparative evaluation of the alternatives is made on this issue, because the project level decisions which influence patch size and fragmentation are highly site specific and in part influenced by the unique mix of all prior decisions. To the extent adverse effects on the values associated with fragmentation and patch size are disclosed by monitoring results, for example the viability of either interior or exterior dependent species, appropriate corrective action will be initiated, including amendment or revision of the Final Forest Plan as may be necessary.

One of the major flaws in the Draft Forest Plan is the failure to implement a rigorous program of inventory and research on species that inhabit the Forest.

Response: Several different kinds of inventories exist or are in development across the Forest, including plant community sampling and description, vegetative resource inventory, and mature and over-mature stand sampling. A complete census of all vertebrate and plant species over an area the size of the entire Forest would not be practical, however. The National Forest System is not chartered to do formal research. Research on many species is occurring within the Forest and Range Experiment Stations and academic institutions, and the continuing need for such research is identified as one of the "Information Needs" in Chapter II of the Final Forest Plan.

By failing to address the reduction in diversity resulting from the liquidation and fragmentation of old growth, the DEIS fails to meet overall NFMA multiple-use objectives and the Endangered Species Act. The Draft Forest Plan disrupts up to one-third of the edge of sites by management activities, which in turn results in the effective loss of much of the rest of the sites by edge effect.

Response: The FEIS recognizes that edge effects occur in both natural openings and into old growth stands, thereby reducing habitat effectiveness (see Vegetation section, FEIS, Chapter IV).

The Forest-wide and management area standards and guidelines in Chapter IV of the Final Forest Plan are concerned with the distribution and functional value of habitat effectiveness. Accordingly, they call for several actions that will help to minimize fragmentation of old growth. For example, no programmed harvest occurs within Wilderness. Riparian areas along class 1, 2, and 3 streams will be managed to provide travel corridors for species which prefer old growth. Special wildlife habitat areas that contain most of the features of old growth will be dispersed across the Forest. Substantial amounts of green trees, snags, and down wood will be left in harvested areas to provide wildlife habitat and inputs of organic matter to the soil. Harvest will be planned to minimize fragmentation of old growth by attempting to maintain larger blocks of old growth for as long as possible into the future.

It is inevitable that old growth will be harvested in general forest, however, and that fragmentation will occur. While it is possible the populations of some species will decline, their underlying viability and therefore the diversity of species within the Forest, will not be reduced.

The DEIS fails to present data making possible evaluation of diversity in terms of its prior and present condition (36 CFR 219.26).

Response: Actual data about the composition and abundance of plant and animal populations from the past is quite limited. Some inferences about past diversity can be inferred from available data about current vegetative cover, with its associated diversity of plants and animals. The most specific available research and academic data about the past diversity of vertebrates on the Forest is found in Harris, L.D., 1984; and it was considered in developing the FEIS. In addition, performing even a current census over the complete plant and animal populations

over an area the size of the Forest is virtually impossible. With these limitations the Forest has had to stress habitat capability in providing diversity; and the consideration of management indicator species in Forest planning should assure that diversity is maintained. Implementation of the monitoring plan for the Final Forest Plan (Chapter V) will provide additional data for future planning.

The documents fail to address adequately potential problems associated with limited genetic reserves in monoculture. Aspects of these possible problems include susceptibility to insects, disease, and fire; the effects on wildlife diversity and habitat; and sustainability of yield and growth rates. There do not seem to be any hardwood management objectives.

Response: The standards and guidelines (S&Gs) in Chapter IV of the Final Forest Plan provide direction for maintaining a diversity of tree species in harvested areas, including retention of hardwood species and conifers of lower economic value. The presence of these species is retained beyond the periods of precommercial and commercial thinning.

Areas reserved from timber harvest will continue to support a variety of overstory and understory species and will serve as sources of seed for adjacent harvested areas. Natural recruitment of most species will occur during succession, and to the extent these are needed to meet S&Gs, they will be maintained in managed stands.

Refer to page III-96 of the DEIS concerning tree improvement. The documents are too optimistic about the superior tree concept, and the seed orchard and genetic improvement projects which are too dependent on long term stability of climatic, edaphic, and physiologic conditions.

Response: The 10% gain for genetic improvement was based on a paper by the Regional Geneticist. This paper was based on a review of existing research data from studies across the nation, involving many different species. The results were highly variable, and the 10% gain used in this Region for seed from physically superior parents is reasonable. Additional gains from using seed orchard stock which has been tested was not used in the Forest's analysis, because the Forest does not as yet produce enough seed to meet the reforestation needs. Maintaining a large genetic pool should be beneficial in providing growing stock that will be better able to adapt to long-term changes in climatic, soil, and physiological conditions. The monitoring plan will provide information to evaluate the volume gain attributed to the genetic program. An additional hedge from such long-term changes rests with the large blocks of protected timber in wilderness, riparian strips, SOHAs, and elsewhere, providing a vast pool of unaltered genetic material.

The DEIS at page III-55 fails to list all sensitive species, their habitats, and a brief description of how the list will be updated.

Response: Complete list of the Region 6 Sensitive Species which are either suspected or documented as occurring on the Forest can be found in Tables III-G-8 (for plants) and III-J-1 (for wildlife). The Forestwide standards and guidelines in Chapter IV of the Final Forest Plan provide direction for biological evaluations, species management guides, updating the sensitive species list, and developing a Forest Watch List.

The standards and guidelines are inadequately specific and comprehensive to establish the procedures by which conflicts will be resolved when proposed management activities may adversely affect sensitive species.

Response: The standards and guidelines in Chapter IV of the Final Forest Plan have been revised to provide specific direction for completing biological evaluations and describe the analysis steps which shall be involved. If sensitive plants or animals would be adversely affected, then appropriate consultation under the Endangered Species Act will occur and appropriate protection or mitigation activities undertaken.

The Draft Forest Plan fails to consider the significant reduction in plant and animal diversity that the high level of timber harvest in Alternative J will cause. These reductions may be in excess of that allowed in NFMA.

Response: All alternatives considered in the FEIS, except No Change, include Management Requirements (MRs) for Managment Indicator Species (MISs). The intent of establishing MRs was to ensure viability of all native and desirable nonnative species by providing suitable habitat distributed throughout the Forest. The primary assumption of the MIS concept is that by managing habitat to the level required to meet the needs of a given indicator species, the habitat needed by all species similarly associated or dependent upon that type of habitat would be concurrently met. The primary difference between alternatives is not the number or diversity of species whose viability will be maintained, but the number of individuals within species that can survive in the amount of habitat provided. Thus, while populations of some species might decline, no species is projected to decline to the point of becoming threatened or endangered. In addition, all alternatives (including No Change) provide protection consistent with the Recovery Plans for the habitat and populations of federally listed threatened and endangered species. The Vegetation and Wildlife section of Chapter IV of the FEIS provides a comparison of the projected effects each alternative will have on the diversity of plant and animal habitat.

The planning documents fail to meet NFMA diversity requirements, because there will be a significant loss in species diversity. This is so because the assumption is inaccurate that managing to meet the habitat needs of given indicator species will concurrently meet the habitat needs of all native and desired nonnative species similarly associated or dependent upon that type of habitat.

Response: Assumptions related to the use of indicator species will be evaluated on a continuing basis to ensure that requirements for the maintenance of native and desirable nonnative plants and animals are met. Three levels of monitoring are provided by the Final Forest Plan Monitoring Plan (Chapter V). Implementation monitoring will provide information to determine whether applicable standards and guidelines are being implemented as prescribed. Effectiveness monitoring will provide information to determine whether the prescribed practices, enhancements, and land allocations are really doing what they were intended to do in meeting Final Forest Plan assumptions and objectives. Validation monitoring will often involve research and administrative studies to determine whether the relationships and assumptions used in the Final Forest Plan are valid. If appropriate, monitoring results may trigger amendments or revisions to the Final Forest Plan to protect species viability.

Ecosystems

Paragraph 4 on page I-5 of the Draft Forest Plan almost seems to imply that timber is the only vegetation. There is inadequate discussion of other types of vegetation.

Response: The Final Forest Plan recognizes that many types of vegetation are represented in the Forest's ecosystem. The description of the Forest in Chapter I of the Final Forest Plan is intended to present only the broadest of overviews, so more specific descriptions of appropriate

detail are found elsewhere in the documents. See the more detailed discussion about vegetation in Chapter III of the FEIS.

Reference page IV-205 of the DEIS in which "relationships" are discussed: The environmental consequences are all timber oriented.

Response: The consequences on many resources are discussed in this section of the FEIS.

The documents inadequately address the need to manage forest ecosystems by undue emphasis on timber harvest. Effects are too often expressed in terms of "timber harvest volumes lost" with no apparent concern for individual plants or animals. Another example is that old-growth is characterized as providing "the backbone for timber harvest," with some mention of the public's recreational and aesthetic concerns, but without any apparent professional concern for the biological knowledge available.

Response: The FEIS and Final Forest Plan have been revised in numerous places to express more directly concerns for ecosystem management. This is particularly evident in the standards and guidelines and management area prescriptions in Chapter IV of the Final Forest Plan. Examples include management for snags and down wood, riparian areas, dispersal corridors, later seral stages (including old growth), and the maintenance of hardwoods and noncommercial conifers in harvest areas. The monitoring plan in Chapter V of the Final Forest Plan provides the mechanism by which the success of the Forest direction in achieving the desired effects of ecosystem management can be evaluated and, if necessary, the Final Forest Plan amended or revised.

While the documents discuss cumulative effects, area planning, long term site productivity, and subwatershed analysis, they fail to consider adequately the effects on an entire ecosystem of the prolonged, repeated removal of biomass when analyzing management strategies. Similarly, references in the DEIS to increasing long term productivity by the conversion of old-growth stands to thrifty young stands on short rotations really applies only to timber productivity: the increased production of wood may not be sustained if ecosystem processes are lost.

Response: The standards and guidelines in Chapter IV of the Final Forest Plan provide for an assortment of management techniques to protect the long term productivity of soils from erosion and the loss of input of organic matter and nitrogen. For instance, there is increased emphasis on retaining large woody debris and managing for nonconifer species to help offset decreases in soil productivity. The standards and guidelines applicable to soil and water quality also address a number of practices to protect soil productivity.

Page III-81 of the DEIS describes ectomychorhizae as pathogens. They are not. They are beneficial and, in fact, most likely necessary for healthy forest ecosystems.

Response: This error has been corrected.

The discussion of "Vegetation" on pages III-39 through III-47 of the DEIS fails to identify what hardwoods and non-commercial conifer tree species occur on upland sites within the Forest, their general abundance in forest stands or their ecological role within the natural, unmanaged forest.

Response: Chapter III of both the DEIS and FEIS discuss the dominant species that occur in the major vegetative series across the Forest, including hardwoods and non-commercial conifers. Descriptions of most plant associations can be found in "Plant Association and Management Guide, Willamette National Forest" (Hemstrom et al. 1987), however. The ecological roles of

most species are largely unknown. Some hardwoods (red alder, for example) have been studied, but most have not.

Page III-69 of the DEIS (Wildlife) states that management activities tend to alter the stages of plant succession in ways that are often structurally similar to natural stages of succession associated with wildfire. This is untrue. Typical forest management practices result in less woody debris, fewer snags, and very few stands with abundant old emergent trees, smaller and more uniform patches and roads.

Response: The Wildlife section of the FEIS has been revised to improve this discussion. Standard vegetative management techniques, including harvest methods, site preparation practices, and reforestation activities frequently do result in conditions that differed from those following natural disturbances. The standards and guidelines and management area prescriptions found in Chapter IV of the Final Forest Plan provide for a number of management practices which will more nearly simulate natural stages of succession. These include practices such as increasing the number of snags, large live trees, and pieces of down wood in harvested areas. In addition, the Final Forest Plan emphasizes riparian areas and dispersal corridors.

The documents fail to consider the effects of the alternatives on a number of climatic concerns. First, no analysis whatever is given in the DEIS as to the differences in CO2 cycles between the endogenous and proposed "managed" forest, nor is any analysis made of the possible contribution the managed forest would make to the world-wide disaster the "greenhouse effect" represents. Second, the effects on climatic shift from the major increases in area albedo made by clearcutting relative to endogenous forest or selectively cut forests are not addressed. Third, the potential synergistic effects on global warming beyond the individual contributions made by the "greenhouse effect" and albedo increases was ignored. Fourth, the DEIS failed to discuss the potential effects removal of vegetal biomass and alterations of transpiration rates might have on desertification: removal of vegetal biomass was recently implicated as coupling with the El Nino/Souther Oscillation in sub-Saharan Africa to contribute to the drought conditions there.

Response: A discussion of many of the concerns and unknowns surrounding future climatic trends can be found in the section on Climate in Chapter III of the FEIS. Monitoring of the success and failure of reforestation by habitat types is discussed in Chapter V of the Final Forest Plan. Such monitoring may provide indicator information about climatic warming trends.

The FEIS acknowledges that management practices such as timber harvest and slash burning contribute to CO2 levels in the atmosphere. The role the northern conifer forest plays in increasing or decreasing the "greenhouse effect" is unknown, and therefore the role of this Forest on the "greenhouse effect" cannot be evaluated at this time. Conversely, the timing, degree, and kinds of effects global warming may have on the Forest's ecosystem are also unknown. The best hedge against major disruption of ecosystems is maintenance of biological diversity and paths for dispersal of organisms across the landscape. Consideration for these factors is given through the standards and guidelines and management area prescriptions in the Final Forest Plan (Chapter IV).

The problems of increased reflectance, albedo, following harvest in our ecosystems is quite short-lived. Summer reflectance should recover rapidly as sites are revegetated during the first year following harvest. Some increase in winter reflectance will occur until trees are tall enough to close canopy and behave as a closed forest. The evaluation of the effects of these local changes on global climate cannot currently be made.

The problems of desertification resulting from continuous removal of biomass in the sub-Sahara are the result of a tenuous balance in that area between drought and vegetation. The climate of the west-side Cascades in the Pacific Northwest is sufficiently mild and moist that desertification has not been detected. Any links between local changes in evapotranspiration following harvest and global climate are unknown.

The diagram showing the Forest "succession to climax" fails to represent adequately most of the Willamette National Forest.

Response: Figures III-G-1 and III-G-3 of the DEIS reflect a tendency for vegetative communities to begin with pioneer species and then move toward climax species composition and structure following disturbance. Due to the historic occurrence of wildfire and other disturbances, climax conditions rarely occur in the Oregon Cascades. Neither of those diagrams were intended to represent the actual distribution of vegetation along that continuum.

The documents fail to address old growth management appropriately by allowing timber salvage harvest for visitor safety. Safety needs can be met by pushing danger trees over and allowing them to deteriorate *in situ*, thereby preserving the structural and functional integrity of the stand.

Response: While dead and down logs are important components of natural ecosystems on the Forest, they may be very inconvenient in some recreational settings (developed sites, for example). The Forest-wide standards and guidelines in Chapter IV of the Final Forest Plan call for leaving trees cut for safety reasons on the ground in most cases; subject to the consideration of management area standards and guidelines.

The Draft Forest Plan fails to outline a plan for conserving significant amounts of natural forest in each ecotype and for each successional stage within that ecotype.

Response: A map of ecotypes or plant associations (Hemstrom et al. 1987), for the Forest does not currently exist. Efforts are underway to produce such a map within the next 5 years. Until that map exists, diversity will be monitored by tracking successional stages by stand types (Chapter V of the Final Forest Plan).

The Draft Forest Plan is in error when it states that the H.J.Andrews has been withdrawn from timber harvest: it has been and continues to be heavily cut over.

Response: The H.J.Andrews Experimental Forest is not part of the programmed harvest. Timber is harvested there for research purposes.

Fire

The catastrophic impacts of wildfires on fish and wildlife resources are not acknowledged in the DEIS. Given the differences in road access and fuel conditions among alternatives, this is a serious oversight.

Response: There can be no doubt that wildfires influence both fish and wildlife habitat. The extent and precise effect fire has on habitat is highly variable and unplanned. Actions taken to remedy the effects of fires are subject to project level site specific analysis. Fires of truly catastrophic proportions may lead to the amendment or revision of the Final Forest Plan.

The influence of management practices on the relative likelihood of fire occurrence is analyzed in Chapter IV of the FEIS. The section on Wildlife, for instance, discusses the effects of prescribed and wildfire on wildlife resources. The standards and guidelines in Chapter IV of the Final Forest Plan provide for a cost-effective and environmentally acceptable suppression response appropriate to the management area in which a fire occurs. In the event certain criteria are met, a more complete documentation of this analysis (known as an Escape Fire Situation Analysis) is undertaken. The combination of the fire protection organization prescribed by the National Fire Management Analysis System and the application of the standards and guidelines are intended to provide reasonable assurance that large areas of the Forest will not be burned by wildfire on a routine basis under any of the alternatives.

The Draft Forest Plan and DEIS overlook the effects of prescribed burning on soil erosion and productivity.

Response: The potential effects of fire on soils are described in the Soils sections in Chapters III and IV of the FEIS. The standards and guidelines and management area prescriptions in Chapter IV of the Final Forest Plan provide guidance to preserve and enhance soil productivity, including in many cases the retention of large woody debris and release for reforestation without burning. When prescribed burning is still indicated, the potential effects of burning are considered during site specific project analysis, including limitations on technique and timing. The monitoring plan in Chapter V of the Final Forest Plan will provide data against which to assess the effectiveness of various post-harvest treatments in minimizing soil erosion and maintaining soil productivity.

The Draft Forest Plan cites reduced fire hazard as one of the justifications for clearcutting. Later on the same page, however, it states that levels of fire hazard and resistance to control will increase with logging. How can it be both?

Response: On a landscape level, forest fragmentation may increase fire hazard over the long term, since managed stands tend to be more susceptible to crown fires. See discussion in the Vegetation section of Chapter IV of the FEIS. At the stand level, fire hazard and resistance to control will normally be increased for a short period of time following timber harvest due to increased fuel loading and changes in microsite weather conditions resulting from exposure to more sunlight and wind. Subsequent timely and appropriate treatment of fuels, however, can reduce both the hazard and resistance to control present on the site to levels lower than would occur under alternative harvest practices which cannot be treated as inexpensively or effectively.

The DEIS failed to recognize the different effects of wildfire on old-growth stands. The major fires of the past few summers indicate less extreme fire behavior and damage in old-growth stands overall than in managed stands and plantations.

Response: It is difficult to generalize about fire behavior and its effects in any one type of stand due to the varying conditions under which wildfires may occur. Variations in fuel loadings, canopy heights and density, and topographic slope position are all important factors in determining fire behavior in stands of any age. In some cases the greater crown heights and cooler understory microclimate present in old-growth stands can reduce the risk of crown fires. This may be offset, however, by heavier fuel loadings and multistoried canopies. In the case of managed stands, the risk of crown fires tends to dissipate over time as the stands increase in crown height and logging generated fuels decompose. Weather conditions are also critical. Under the type of conditions that existed during the summers of 1987 and 1988, virtually any of these stands has the potential to be threatened and severely damaged by fire.

On page III-69 of the DEIS it was suggested that timber harvesting mimics the stand conditions created by natural wildfires. This assumption is incorrect. Natural burns result in a mosaic of unburned timber, standing dead trees, and scattered concentrations of down, woody debris. This does not describe your average clearcut.

> **Response:** It is true that "clean" harvest units do not tend to be directly comparable to stand conditions resulting from natural wildfires. Logging practices and subsequent silvicultural treatments prescribed under the standards and guidelines found in Chapter IV of the Final Forest Plan will result in leaving a variety of standing trees, distributed down woody debris, and concentrations of untreated harvest residues that much more closely simulate the mosaic resulting from natural wildfires than was present under former practices.

Most of the serious fires on the Willamette National Forest in the last 30 years have been the result of escaped slash burns. The rate of harvest and slash burning presented in the documents will increase the risk of fire damage rather than decrease it as suggested by the DEIS.

> **Response:** Historically, most of the significant or catastrophic fires in the western Cascades were ignited and spread from large areas of untreated logging slash. The Vegetation section of Chapter IV of the FEIS discusses the activities that are expected to lead to increased risk of fire. While there is some risk associated with prescribed burning, these risks are reduced by appropriate timing and methods. The result of burning is to reduce the risks associated with heavy fuel concentrations.

You have not done an effective job of explaining the 3C policy. The reaction of the public to the Yellowstone Fire is symptomatic of the lack of understanding that most have concerning the valuable role that naturally occurring fire plays in ecosystem vitality. Emphasis should be given to educating the public in this arena.

> **Response:** The "3-Cs" are confine, contain, or control. They are not a "policy" as such, but rather they are strategies for the suppression of wildfires. Since each wildfire is unique, the specific suppression strategy and the techniques used to achieve it are the subject of site-specific consideration, consistent with the appropriate standards and guidelines (S&Gs) for Fire and the management area S&Gs. Some discussion of the role of fire appears in the Vegetation and the Fire sections of Chapter III of the FEIS. As more is learned about the effects of fire, the Forest Service will continue to make that information available to the public.

Fish

The DEIS projects about 800,000 salmon smolts across all alternatives, despite considerable differences in the projections for sedimentation and watershed degradation between the alternatives. What is the methodology and reliability of your fish projection model, and how can it be that significantly differing levels of sedimentation do not more decisively influence the production of smolts? Can you display the projected fish production by watershed?

> **Response:** The estimate of smolt habitat capability across the various alternatives was derived in consultation with appropriate Oregon Department of Fish and Wildlife biologists, Forest biologists, and Forest hydrologists.
>
> The smolt habitat capability estimates in the DEIS were based on the quantity and quality of habitat available. Enhancement projects which increase the quantity of habitat accessible to

anadromous fish are shown as the "enhancement" level in Chapters II and IV of the FEIS. Smolt increases associated with increases of the quantity of habitat outweigh the differences between alternatives. What differences there are between the alternatives were estimated based on riparian management, the amount of sediment, and hydrologic recovery, and the accuracy of the assessment is not improved by displaying estimated production by watershed. Appendix B of the FEIS provides more detail about the methods used to identify differences between the alternatives. The need for improved models to estimate smolt production has been identified as an additional information need in Chapter II of the Final Forest Plan.

While fish habitat enhancement structures no doubt positively affect the capacity of the Forest to produce fish, the degree to which the Forest relies upon them to maintain the fishery is unclear. What is the scientific basis for that level of reliance?

Response: This information has been clarified in Chapter IV of the FEIS. Estimates of the effectiveness of enhancement projects are based on available data from assessing existing stream conditions before enhancement projects are undertaken and then monitoring the subsequent effects of the project on stream conditions. Some of this data is from published research; and some is based on the professional judgment of Forest and ODFW biologists. The monitoring plan in Chapter V of the Final Forest Plan will provide the method by which the implementation and effectiveness of enhancement projects can continue to be evaluated and appropriate corrective actions undertaken if indicated.

The DEIS failed to discuss adequately the relative merits and costs between leaving large woody debris in streams compared to installing gabions, log sills, and other "constructed" enhancements.

Response: The standards and guidelines in Chapter IV of the Final Forest Plan protect future sources of large woody debris for streams in differing amounts. The analysis of the relative costs and effectiveness of different enhancement methods is discussed in Chapter IV of the FEIS.

Funding for many of the mitigation, enhancement, and monitoring projects seems tied to timber harvest activities (e.g. Knutson-Vandenberg Act). It seems illogical to need first to initiate activities which degrade the fishery in order to obtain the funding necessary to then restore, perhaps enhance, and later monitor the condition of the fish habitat.

Response: The fisheries management program is funded both through direct allocations from Congress and with collections authorized by the Knutson-Vandenburg Act. Planning a timber sale includes development of a Sale Area Improvement Plan (SAI plan) to determine the amount of KV funds collected. that can be funded through collections authorized by the Knutson-Vandenburg Act. As a minimum, the projects in SAI plans mitigate for the direct impacts of the sale. Frequently, the SAI plan identifies opportunities to either improve upon the quality of the natural habitat or to rehabilitate habitats damaged by some previous natural or man-caused event.

Monitoring activities identified in the SAI plan may either document the effects of the timber sale activity or the results of the fish habitat projects (FSH 2409.19, section 16.4). Monitoring results will guide future projects as well as document either the effectiveness of the specific plan being monitored or the need for revision.

Although the DEIS states that no estimates of abundance of resident cold water have been attempted (DEIS III-63), it also asserts that the overall supply of native resident cold water fish has not changed

significantly over time (DEIS III-62). How do you know there have been no significant changes in supply if you do not have estimates of how many there were and are now?

Response: The statement has been clarified in Chapter III of the FEIS to indicate that the abundance of fish are not known to have changed significantly over time. Chapter II of the Final Forest Plan identifies the need to obtain this information, and the monitoring plan in Chapter V of the Final Forest Plan provides for monitoring of resident fish populations in cooperation with ODFW.

The DEIS inadequately addresses the habitat needs of nonsport species. Nor is the discussion about the Forest's anadromous fish potential complete.

Response: The analysis is limited to anadromous and resident trout species because they were selected as Management Indicator Species (MIS). The basis for this selection included their commercial and recreational importance, as well the assumption that their sensitivity to habitat changes could adequately represent the habitat needs of nonsport species.

The discussion about the Forest's anadromous fish potential has been expanded in Chapter IV of the FEIS.

The DEIS seems to imply that fish passage improvements increasing access to presently blocked habitat are all that are needed to increase anadromous fish production. Such an implication would be in error. Further, even allowing that fish passage improvements would help somewhat, reliance on many of the activities seems misplaced. For instance, it seems highly unlikely that fish passage over Cougar Dam is feasible and will occur. Elimination of passage barriers on the South Santiam River seems of questionable value when the real problem is downstream passage at Foster Dam, and even passage there would be of little benefit until the Oregon Department of Fish and Wildlife (ODFW) places spring chinook above the dam. Hauling fish around barriers has yielded little success; and the pre-smolt release program above Green Peter Dam has not been successful, either.

Response: The technology of improving fish passage around barriers will continue to be developed by several public agencies in the Northwest. One goal of the Final Forest Plan is to maintain and enhance anadromous and resident fish populations, which is consistent with the Northwest Power Planning Council's goal to double anadromous fish runs by the year 2000. This requires continuing to work cooperatively with the various agencies to find solutions. Projections of increases in smolt resulting from possible solutions are based on the success of similar projects at other sites.

Concerning specific sub-basin plans, the Oregon Department of Fish and Wildlife (ODFW) was contacted to determine specific management scenarios for individual subbasins. Since ODFW recently proposed additional studies for maintaining wild fish in the South Santiam Basin (Emery Wagner 12/1/89), the Forest presumes this subbasin is intended as anadromous fish habitat.

Since the elimination of fish passage barriers is under the control of other agencies, the probability of removal should be the same under all alternatives.

Response: All of the alternatives in the FEIS include improving opportunities for anadromous smolt and adult escapement, by increasing passage on the South Santiam, McKenzie, and Fall Creek drainages. This is described in the changes between Draft and Final in Chapter II of the FEIS.

The DEIS inadequately addresses the steps the Forest will take to coordinate its activities with the plans of the Oregon Department of Fish and Wildlife (ODFW) and other agencies. For example, what is the relationship between the Forest Plan and ODFW's subbasin and other species plans?

> **Response:** The FEIS (Chapter IV - Fish discussion of the "Relation to other Plans" section) and the standards and guidelines to the Final Forest Plan have been revised to include a more thorough description of the relation of the Forest Plan to ODFW subbasin plans.

The DEIS is in error when it states that the ODFW determines the level of fishing by the issuance of fishing licenses (DEIS IV-77).

> **Response:** This error has been corrected in the Chapter IV of the FEIS.

The DEIS is in error by stating that reservoirs and road accessible lakes are stocked with both legal sized and fingerling trout and salmon.

> **Response:** The statement has been changed in Chapter III of the FEIS to read: "Concurrently, they stocked the reservoirs and road-accessed lakes with either legal-sized or fingerling trout."

Multiple Use

Reference page III-144 of the DEIS and Appendix C-6 through C-308 where the statement quotes areas "...released for multiple use management..." according to the Multiple Use Act the statement would include management for Wilderness. True, the Oregon Wilderness Act (C2 & 4) uses the same statement but then it is qualified to mean something different than the definition in the Multiple Use Act. The Forest didn't qualify the term when they used it in the roadless area dialogues. Thus these areas can still be considered for wilderness.

> **Response:** Congressional direction in the Oregon Wilderness Act of 1984 prescribes the manner in which areas that are currently in roadless condition will be considered during this round of planning. Chapter III discusses those limitations. Mt. Hagen was reviewed in this round of planning. In future planning cycles, remaining roadless areas will be considered for wilderness.

Reference the Draft Forest Plan at IV-146, MA 11C Scenic, and other MA 11's first paragraph. The term "multiple use" is used incorrectly.

> **Response:** Outdoor recreation is one of the categories for which national forests are administered under the Multiple-Use Sustained-Yield Act, and "multiple use" under that Act means the management of all the various renewable surface resources to allow utilization in combinations that best meet the needs of the American people. While visually pleasing landscapes normally enhance outdoor recreation experiences, the wording in the Draft Forest Plan for Management Area 11 was intended principally to clarify that management of those areas was not necessarily limited to visual considerations. The standards and guidelines for Management Area 11 in the Final Forest Plan clarifies this intention.

The Goal for Old Growth at IV-3 (Management Plan) is not sufficiently specific. It should provide for old growth stands representative of the variety of habitats and for their contribution as a share of the natural complexity of ecological diversity, esthetics, etc. Throughout the document one is led to believe that the Multiple Use Act has been repealed and that the dominant use theory reigns supreme. (Ref. DEIS I-18, Timber Supply).

Response: Our understanding of the contributions made by complex ecosystems such as old growth, particularly in terms of plant and animal diversity, is continually developing. The Standards and Guidelines have been modified to reflect better our improving understanding of the values that stands with old-growth structure provide. In particular, the discussions for Management Area 7 address the concerns expressed in this comment more fully and specifically.

The first paragraph at page III-193 of the DEIS implies that "...total multiple use benefits..." where timber harvest has been coordinated with other uses, be "reflected in the Forest's cash flow analysis of a timber sale." If the Forest Plan is truly a multiple use plan, then benefits would accrue to other resources.

Response: The intention of that paragraph was to explain the reasons why the direct costs of some timber sales may exceed the direct revenues collected from the sale. Since the DEIS was issued the Forest Service has implemented a method to evaluate the timber sale program on each National Forest that better reflects the total costs and benefits of the program (the Timber Sale Program Information Reporting System, or TSPIRS). The underlying objective of the Forest Plan is to maximize net public benefit, which is the combined priced and nonpriced outputs. These are described in Section E of Chapter II of the FEIS.

Reference pages IV-5 and IV-6. The description of the Forest 10-50 years hence does not imply a lot of resource coordination. For example, "...forests are managed for intensive timber harvest...", "...others managed for other specific values," "...will take on a more managed appearance." Not much indication of enhancing or even maintaining ecosystem complexity, just simplification. What options will exist in 50 years to change/reverse management direction?

Response: An important feature characterizing the Desired Future Condition of the Final Forest Plan is that, within the context of multiple use management, emphasis is placed on preserving and enhancing connective corridors between resource values and on preserving options as our understanding of forestry principles and social needs changes. Connective corridors provide the vehicle through which plant and animal diversity and complexity can diffuse throughout the landscape; and preserving options enhances the range of management choices for as long as possible, consistent with program direction. The specific options which will remain open in 50 years will be at least partially a function of both project level decisions, amendments and revisions to the Forest Plan, and new Forest Plans that are developed during that interval.

The Forest Management Goals at IV-2 are stated as "...multiple use goals," and "...responsive to issues, concerns, and opportunities," and yet lack in resource coordination and professional concerns.

Response: The Forest used an interdisciplinary approach in developing alternatives and analyzing the effects of specific management activities upon the various resources. In addition, the Forest carefully considered public input in producing the FEIS and Final Forest Plan, many of which comments were provided by scholars and agencies having not only special expertise in specific disciplines but who were also knowledgeable of the effects of proposed activities upon forest environments.

The documents inadequately addressed the effects of weekend logging activities with other public uses.

Response: The specific timing of logging activities was not considered in the alternatives presented in the FEIS. Restraints, such as limits on weekend logging activity where resource

activity conflicts occur, can be implemented under any alternative, as appropriate, consistent with applicable standards and guidelines.

The documents fail to give adequate recognition to the benefits that accrue from forest management and protection, such as protection from catastrophic fire, and insects and disease, to name a few.

Response: Recognition of these benefits is implicit in the discussion of Chapter IV of the FEIS, because the consequences which are described assume levels of management and protection consistent with the intensities appropriate to the various alternatives. In the Final Forest Plan, the Forest-wide and Management Area standards and guidelines describe more specifically the actual management practices which would be implemented and the anticipated benefits or results which would be expected to accrue.

Planning

Adequacy of Analysis

All the alternatives fail to address significant issues that would arise if actions corresponding to these alternatives were taken.

Response: Chapter IV of the FEIS addresses the consequences to the environment that are anticipated by the adoption of each alternative considered.

The DEIS fails to provide an accurate assessment of each alternative by comparing its level of outputs and economic returns to those suggested by RPA and State of Oregon Forestry programs.

Response: Each alternative presents a different, integrated "vision" of the Forest, producing a wide range of outputs (and economic returns) against principal Forest resources. Each alternative is described in detail in Chapter II of the FEIS and the environmental effects of each alternative on the principal Forest resources are discussed in Chapter IV of the FEIS. Chapters II and IV therefore provide the reader with the opportunity to make comparisions both within and between alternatives.

In the context of timber production, readers should compare the various alternatives in Chapters II and IV of the DEIS against Alternative B (RPA) and Alternative J-Departure (FPFO). These two alternatives were not fully analyzed in the FEIS, because public comment was generally negative toward departure alternatives.

The DEIS fails to incorporate the required analysis of MMRs, reveal the impact of the Vegetation Management EIS, or consider how the spotted owl SEIS affects the Plan.

Response: Neither the Vegetation Management EIS nor Spotted Owl EIS decisions were available at the time of publication of the Forest's DEIS; however, some analysis of the then-preferred Alternative F of the Spotted Owl draft supplement was presented in Appendix G of the Forest's DEIS. A sensitivity analysis of the MRs was presented in Appendix H of the Forest's DEIS, and a summary of the background and development of MRs specific to the Forest was presented in Appendix B.

Since the publication of the DEIS, decisions on both the Spotted Owl Supplemental EIS and the Vegetation Management EIS were made. Updated discussions about Vegetation Management

and the Spotted Owl SEIS can be found in Chapter III of the FEIS; and updated discussions of MRs can be found at Appendices B and G of the FEIS. In addition, since the Standards and Guidelines implement these various decisions, the S&Gs are a good source for readers to consult in determining how the decisions affect the Forest Plan.

Adequacy of Information

The Draft Forest Plan is deficient since it recommends actions that will alter roadless and riparian areas for which there are 15 topics with missing data categories listed at II-9 and II-10 of the Draft Forest Plan.

Response: Simply because information needs are identified in the Final Forest Plan does not mean that data is totally missing for the subjects and resources listed. Rather, the listing indicates areas where emphasis should be given for acquiring additional data and information. The best available data was used in the development of the planning documents. On-going research and inventories are a key part of the evaluation and monitoring phases of the Final Forest Plan. Changes will be made as needed.

The DEIS summary fails to give acreages for old growth and roadless areas now found on the Forest.

Response: A recently completed inventory of stand conditions on the Forest is referenced in the Final Forest Plan and FEIS, including estimates of the amount of old growth stands by forest type. Additional information can be found in the treatments of Old-Growth and Roadless Areas in Chapter III of the FEIS, as well as Appendix C to the FEIS dealing with Roadless Areas.

Page B-98 of Appendix B fails to provide a definition of the three categories of jobs provided.

Response: Appendix B to the FEIS now provides these definitions.

The Final Forest Plan should summarize or cite the criteria that will be used to determine when categorical exclusions, environmental assessments, and environmental impact statements will be used in Plan implementation, especially with regard to assessing impacts to water quality and beneficial uses.

Response: The section on Implementation in Chapter V of the Final Forest Plan refers to the fact that the Final Forest Plan and FEIS will be used for reference and tiering of projects and activities subject to the requirements of the National Environmental Policy Act (NEPA). The Forest Service Manual and Handbook system, available at the Supervisor's Office, provides extensive direction about the criteria used to meet NEPA requirements.

The documents fail to provide an adequate explanation for the process by which the seven key issues were identified and whether they were prioritized.

Response: The principal requirements governing issue identification are 40 CFR 1501.7 and 36 CFR 219.12(b). The process by which the seven key issues were identified is discussed in Appendix A, including refinements to those issues during the period between publication of the DEIS and FEIS. There was no prioritization between the seven key issues. As explained in Appendix A, all the issues were considered during the development of the alternatives, but the degree of response to the key issues was of greatest importance in the selection of the Final Forest Plan.

The summary fails to discuss why cumulative effects of each alternative after the fifth decade are described, particularly when new Plans will be developed in 10-15 years.

Response: The objective of keeping the summary short required draconian selectivity in the choice of topics treated there.

Each alternative is required to state, among other things, the condition and uses that will result from long-term application of the alternative (36 CFR 219.12(f)9(i)). In addition, analysis covering that period helps provide a link to national-level planning efforts mandated by the Forest and Rangeland Renewable Resources Planning Act which involve a planning horizon of similar duration.

Alternatives Considered

The lack of alternative environmental constraints or mitigation measures narrows the range of alternatives considered in the Willamette Plan.

Response: The scope of alternatives needed to be analyzed is determined by the scope of the proposed action. Since the action being considered here does not involve an irretrievable commitment of resources, the associated environmental impact is very limited. The range of alternatives that reasonably must be considered are those necessary to permit a "reasoned choice," and there is no requirement to analyze the virtually infinite number of alternatives that are possible.

In developing this Forest Plan, numerous different "visions" of the Forest were considered, producing a wide range of outputs against principal Forest resources. Except for the NC Alternative, standards and guidelines establish management minima to be responsive to the laws and regulations. Before undertaking site-specific actions further analysis following NEPA procedures will be made, at which time further consideration of appropriate environmental constraints or mitigation measures will be undertaken. In addition, Management Area prescriptions describe the practices to be applied within specific management areas to attain the goals and objectives for those areas. As the amount of area to which specific Standards and Guidelines and Management Area prescriptions apply vary from alternative to alternative, differing levels of environmental constraints and mitigation measures are contemplated.

Exclusion of the ONRC Alternative from serious comparison, public review, and consideration was arbitrary and capricious. The ONRC Alternative was evaluated by FORPLAN, represented a mix of resource uses not presented elsewhere, and did not specifically propose new Wilderness. The Summary's failure to delineate this is violative of 40 CFR 1502.14(2).

Response: Discussion of the alternatives, including those eliminated from detailed study, appropriately takes place in the Chapter entitled, "Alternatives, Including the Proposed Action," rather than in the Summary (40 CFR 1502.14). Some information about the ONRC Alternative was presented on pages II-21 through II-27 of the DEIS. The Forest's reasons for not fully analyzing the ONRC Alternative were discussed on pages II-21 and II-22 of the DEIS.

During the interval between the DEIS and FEIS, the Forest decided that it would be in the public interest to analyze fully a revised alternative provided by the ONRC. Discussions were held with the ONRC to identify changes the Forest felt were necessary to provide comparability between fully analyzed alternatives, with the result that an alternative based in large measure on ONRC input is fully analyzed in the FEIS.

A number of individuals and organizations proposed partial alternatives, frequently expressed in terms of outputs associated with specific resources. In addition, some felt the alternatives proposed by the Forest Service created an unmanageable dichotomy of choice for public respondents by only allowing choices between whole groupings of ideas.

Response: The Final Forest Plan is a framework for management rather than an absolute commitment to conducting a specific set of projects.

The FEIS reflects the estimation and consideration of a range of outputs and activities that can reasonably be expected to be produced from the natural resource base of the Willamette National Forest. In the process of selecting a reasonable range of alternatives, many possible combinations or permutations of alternatives were not developed. The process of narrowing the possible alternatives considered to a manageable and reasonable range is appropriate under the National Environmental Policy Act (NEPA).

The alternatives prepared by the Forest provided for a wide range of reasonable and integrated management scenarios for the various uses of the Forest. Each alternative was intended to provide a different response to the total set of demands considered in the planning exercise. Such alternatives cannot be completely specified by single outputs or small groups of outputs, because multiple use management affects a wide array of resource values, in both economic and noneconomic ways. The principal reason for displaying estimated output levels for the various resources under the alternatives is to assist the public in better understanding some of the possible consequences of implementing a particular alternative.

Legal Adequacy

The DEIS and the Draft Forest Plan fail to meet the original and primary purposes of the Organic Administration Act by elevating a variety of other resource values over the production of timber.

Response: Management of National Forest System lands is subject to a wide array of laws, regulations, and other binding authority. Much of the early legislation, such as the Organic Act, did emphasize water and timber supply in the establishment of Forest Reserves. Later legislation, primarily in the 1960s and 1970s, further clarified Congressional intent regarding actual management of the natural resources found within established National Forest System lands. In addition, many other laws of general applicability such as the Clean Water Act and Endangered Species Act, influence the management of the National Forests.

The sum effect of this Congressional management direction requires the Forest Service to consider, consistent with procedural mandates of the National Environmental Policy Act, a range of resource values over a variety of reasonable alternatives in Forest planning. A number of such alternatives have been developed and analyzed in this Planning round, including some which place relative emphasis on timber production.

The DEIS is inadequate since none of the alternatives are sufficiently flexible to allow for management of specific areas or circumstances which may arise. In addition, the Forest Land and Resource Management Plan (FLRMP) is an irretrievable and irreversible commitment of resources without the required worst case analysis, because all the areas of uncertainty mentioned under information needs (LMP II-9) are serious uncertainties. Finally, the process from which the documents are derived relies too heavily on projections based on past management practices.

Response: Flexibility is provided in all alternatives by the nature of the planning process. The alternative chosen by the Record of Decision is programatic in nature, and generally does not itself make site-specific irretrievable commitments of natural resources. Site-specific analyses and decisions, tiering to the Forest Plan and consistent with NEPA requirements, are made at the time specific projects governed by the Forest Plan are considered.

In some cases, consideration of proposed site-specific actions may benefit from improved scientific information available at the time project analysis is undertaken. In other cases, the local nature of a proposed site-specific action may allow for consideration of more detailed data than was available during development of the Forest Plan.

Even should some matters remain uncertain when specific projects are evaluated, however, the NEPA process does not contemplate absolute certainty in all things. Rather, if faced with unavailable information about a reasonably foreseeable significant environmental consequence, the decision-maker's duty is to summarize existing credible scientific evidence about possible adverse impacts, and to evaluate such impacts based on theoretical approaches or research methods generally accepted by the scientific community. On the other hand, if information remains unavailable about a remote but potentially severe impact, then the duty is grounded in evaluation of the scientific opinion rather than in the framework of conjectural worst case analyses.

The best available information and scientific evidence was used in the development of the Forest Plan, FEIS, and related documents. This information included, as appropriate, projections based on past management practices.

Finally, Forest Plan monitoring provides a basis for reasoned data collection and analysis to determine whether amendments or revisions to the Forest Plan are indicated, consistent with NEPA procedures.

There is inadequate integration of other national policies and interests (e.g. energy self sufficiency, trade goals, access rights for handicapped, stabilizing local economies, and strategic materials).

Response: Assisted by public input, the Forest developed a list of the vital issues, concerns, and opportunities faced by the Forest in this planning period. That information helped focus the analysis and development of an array of alternatives which provided different responses to the identified demands. The selected alternative is judged to provide for multiple use and sustained yield of goods and services in a way that maximizes long term net public benefits in an environmentally sound manner. In addition, this Forest Plan can be amended or revised as necessary in response to signficant changes in public concerns.

Planning documents fail to defend departure schedules with reference to non-timber statutory multiple-uses, namely outdoor recreation, range, watershed, and wildlife and fish. Rather, departure is predicated on the goal of insuring employment and that the wood products industry would not go through a slump (DEIS, p.IV-204).

Response: 36 CFR 219.16(a)(3) requires that departure alternatives be considered when any of four conditions exist. Alternative B was considered, in part, to meet some assigned RPA program goals. Alternative J Departure was considered, in part, to meet timber volume objectives set for the Forest by the State Department of Forestry through its Forestry Program for Oregon, thereby contributing to State efforts to avoid substantial adverse economic impacts to communities.

Both departure alternatives considered in the DEIS also produced substantial benefits to some other programs (e.g. range, minerals, organizational support, and service to the public), while meeting management requirements to retain the viability of other resource values. See DEIS, II-17, II-45-47, and II-68-71.

Public comment directed to departure alternatives was generally unfavorable. Accordingly, these alternatives have not been reanalyzed in the FEIS, but remain available to the Regional Forester for decision.

All the alternatives with the exception of "C," violate 36 CFR 219.27(E) which forbids sedimentation from riparian MMRs.

Response: A number of comments expressed concern about watershed degradation, both within and outside riparian areas. Chapters II and IV of FEIS and Forest Plan, as well as Appendix D, materially revise the treatment of riparian areas and watersheds in some alternatives, including the preferred alternative. The regulation prohibits "serious" adverse effects on water conditions and fish habitat, and no violation of State Water Quality laws are anticipated due to the use of Best Management Practices (BMPs) required by the standards and guidelines. Monitoring results will alert management should unforeseen violations of State Water Quality laws occur and remedial actions will be taken. If necessary, practices will be modified over the life of the Plan, and if further necessary, the Plan may be amended or revised.

The DEIS, Appendices, and Forest Plan do not satisfy requirements of NEPA because the documents exceed the 300 page limit set by 40 CFR 1502.7 and because the Summary suffers the opposite problem by being so brief that the public is unable to evaluate the real tradeoffs being made in the published alternatives.

Response: EISs are intended to provide a full and fair discussion of significant environmental impacts and inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment. At the same time, CEQ policy clearly encourages that EISs and their summaries be kept brief: "The text of final environmental impact statements...shall normally be less than 150 pages and for proposals of unusual scope or complexity shall normally be less than 300 pages" [40 CFR 1502.7], and "The summary will normally not exceed 15 pages" [40 CFR 1502.12].

The overriding consideration, however, must be to provide the full and fair discussion. The CEQ recognized this when it said in its Supplementary Information, "The Council recognizes the tension between the requirement of a thorough review of environmental issues and a limitation on the number of pages that may be devoted to the analysis....The inclusion of the term 'normally' in this provision accords Federal agencies latitude if abnormal circumstances exist."

The Forest considers this planning cycle to represent a situation of "abnormal circumstances" contemplated by the CEQ. This Plan constitutes the first NFMA Plan for the Willamette National Forest, involves broad programmatic decisions for the next 10-15 years for a very large area of land holding many different natural conditions, and seeks to maximize the net public benefits over this significant spatial-temporal span when competing public demands exceed available resources.

The public good achieved by good decisions outweighs adherence to arbitrary page limitations.

None of the alternatives provide for mandated sustained yield.

Response: With the exception of the departure alternatives considered in the Draft EIS (Alt. B and J-Departure), all considered alternatives contain base sale schedules producing timber yields in successive decades that equal or exceed the planned sale for the proceeding decade (i.e. meet nondeclining yield principles), and all alternatives considered in both the Draft EIS and the Final EIS meet long-term-sustained-yield over the term of the planning horizon.

The documents have failed to present an adequate range of alternatives. For example: The documents failed to provide more options between J Preferred and ONRC; there was no alternative which provided enough protection of certain resource values; there was no alternative which provided enough availability of certain resource outputs; there was no alternative which provided the specific sort of protection I wanted for specific site(s).

Response: There are no specific requirements constraining the exact number or "placement" of alternatives relative to each other against particular resource outputs. The objective in developing a range of alternatives is to provide a wide range of reasonable management scenarios for the various uses of the Forest, and indeed they cannot be completely specified by any single output. Distribution between the minimum resource potential and the maximum resource potential is primarily to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the forest, providing different ways to address and respond to the major identified public issues, management concerns, and resource opportunties. It is neither feasible nor required for informed decision making that every alternative device and thought conceivable by the human mind be considered.

The decision process is inappropriately reduced to one based solely on economic considerations by the inclusion of "economic efficiency."

Response: The decision process is intended to provide for multiple use and sustained yield of goods and services in a way that maximizes long term net public benefits in an environmentally sound manner (36 CFR 219.1(a). The term "net public benefits" by definition is "an expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index (36 CFR 219.3)."

In many cases economic considerations can be measured or estimated, and they can yield important, but by no means exclusive, indications of social benefit. By 36 CFR 219.12(e)(1)(iii), forest planners must conduct monetary benchmark analyses estimating the maximum present net value of those resources having an established market value or an assigned value to provide a basis for formulating a broad range of reasonable alternatives. In addition, costing information is important for providing a reasoned basis for selection of that particular set of available management prescriptions meeting the objectives previously established for each alternative (36 CFR 219.12(f)(8)); but cost efficiency itself does not drive the setting of the objectives for any specific alternative.

In these ways economic information was indeed used, but not exclusively used, in the formulation of alternatives. The Record of Decision discusses the types of information and rationale supporting the decision made by the Regional Forester.

1980 and 1985 RPA analysis and Forestry Program for Oregon Harvest targets for the Forest were ignored in terms of the Forest's requirement to assess environmental impact of producing harvest levels less than reported in the referenced documents.

Response: While the Forest is required to analyze the environmental effects of adopting the various alternatives, there is no specific requirement to assess the environmental impact of producing harvest levels less than the RPA and FPFO goals in the other considered alternatives. Consequently, one factor that is analyzed for each alternative is the environmental consequence of producing the harvest level that the particular alternative calls for.

Alternative B-Departure was intended, among other things, to reflect RPA harvest targets. Alternative J-Departure was intended, among other things, to reflect timber volume objectives set for the Willamette National Forest by the Oregon Department of Forestry's Forestry Program for Oregon. Descriptions of these two alternatives and the remaining alternatives which do not meet the timber harvest targets of RPA and FPFO are provided in Chapter II of the FEIS and DEIS. Comparisons between all the alternatives appear throughout the DEIS and FEIS, and in particular the environmental effects are analyzed in Chapter IV of those documents. Appendix B provides important discussions of economic efficiency analysis and social and economic impact analysis.

Only one set of MMR strategies is proposed in the Plan. Where alternative methods for achieving the same objectives are available, the documents should display them.

Response: As described at page II-30 of the DEIS, alternative methods of meeting the Management Requirements (MRs) were evaluated in the Analysis of the Management Situation (AMS). The AMS was available for public review throughout the public review period for the DEIS, and planning personnel were available to provide explanations or answer questions.

Once a strategy was developed for each MR, this strategy was applied to all alternatives (except the No Change Alternative) to provide a consistent basis against which to evaluate the alternatives.

Monitoring

The results of the FORPLAN solution for the Draft Forest Plan were completely ignored in the implementation and monitoring section.

Response: The role of the FORPLAN model is to provide a comparative basis for analyzing a range of alternatives and predicting some resource outputs. In contrast, standards and guidelines direct implementation. FORPLAN may be used again after implementation as one tool to evaluate possible responses to monitoring results.

The Draft Forest Plan is excessive in its management guidelines and needs to be more balanced. Until economic diversification plans show results, we need to protect and maintain the current base.

Response: The implementation and monitoring phases of Forest planning provide the structure through which assumptions can be tested. If the results of these activities indicate the need for an amendment or modification to the Final Forest Plan, then the Plan can be updated to reflect needed changes in management practices.

Public Participation

The decision to reduce timber production on Forest violates public participation mandates in the Administrative Procedure Act (APA) and NFMA.

> **Response:** The opportunity for public participation was afforded by following National Environmental Policy Act procedures throughout the land management planning process. Administrative appeal of the decision is available through voluntarily provided agency appeals procedures found in 36 CFR Part 217. Only the broad principles of the Administrative Procedures Act apply to such voluntarily provided agency appeal procedures, including fairly provided notice and opportunity to be heard. Upon compliance with applicable procedural requirements, appellants disappointed with the agency decision upon appeal may pursue judicial remedies.

NFMA public participation mandates were precluded by the use of linear computer models and MMRs.

> **Response:** The National Forest Management Act (NFMA) set legal guidelines for planning and management of the National Forests. National direction resulted in MRs which reflect the requirements of the NFMA. The MR direction ensures that minimum legal requirements are applied to all alternatives in Forest plans consistently across the National Forests. MRs exist for dispersal of created openings, water quality, riparian, and fish wildlife habitat as required by NFMA.
>
> Discussions in Appendix B, Appendix H, and Chapter II of both the DEIS and FEIS explain how MRs were developed and applied on this Forest. Similarly, discussions in Chapter II and in Appendix B explain the manner in which linear programming models were used by the Forest. Public review and opportunity to comment was provided by the discussions in the DEIS.

Several comments were concerned with the way in which the public responses to the Draft EIS would be used and the time allowed in which to comment. Some considered the process to be a referendum, either approving or disapproving of that result. Some believed the magnitude of the reponse represented by organizationally sponsered letter campaigns should be accorded great weight; others questioned the value of either the extent or content of the responses such campaigns produced. Some felt that not all comments would receive attention. Finally, some felt the time allowed to review the documents was inadequate for the public to formulate meaningful comments.

> **Response:** The Forest Plan is intended to provide for multiple use and sustanined yield of goods and services from the National Forest System in a way that maximizes long term net public benefits in an environmentally sound manner. National Environmental Policy Act (NEPA) procedures are used help obtain the information that is needed to produce that result; and NEPA stresses that, "it is not better documents but better decisions that count." Public involvement serves not only to disclose contemplated Federal action, but to provide an opportunity to improve the quality of decisions made.
>
> Public involvement is important throughout the process of Forest planning. It is particularly critical in helping alert agency representatives to public needs and crystalizing those issues, concerns, and opportunities which are of overriding concern. Public involvement is also critical in tapping the expertise of the public to examine the technical adequacy of the documents, and to guage the overall responsiveness of the documents to the resolution of critical issues.
>
> The public comment period did not represent a "vote" of the public binding the Approving Official to some notion of numerical plurality. The objective remains to produce a plan that provides for

multiple use and sustained yield of goods and services maximizing long term net public benefits in an environmentally sound manner. The extent and force of sentiment relative to the important issues of Forest planning, however, is extremely valuable in assessing responsiveness to the social and economic demands of the American people.

The "substantive" comments, and the responses to them, represent the bulk of this Appendix. These were the responses that upon Content Analysis and Interdisciplinary Team review were judged to provide "factual information, professional opinion or informed judgment." The other comments that are not treated here, however, are also important in their own right.

The DEIS and related documents were first released on December 7, 1987. The closing of the public comment period was originally scheduled for March 31, 1988. This date was later extended to May 16, 1988, to provide additional opportunity for meaningful review.

More information about the manner in which comments were treated can be found in other portions of this Appendix.

Principles of public involvement will be violated by failing to allow the public to review a set of alternatives with corrected data.

Response: The Forest found that public analysis of the DEIS was extremely thorough and thoughtful, resulting in numerous corrections, refinements, and indeed the development of three new alternatives, including a new preferred alternative.

NEPA requires preparation and circulation of a revised draft only if the initial draft statement is so inadequate as to preclude meaningful analysis (40 CFR 1502.9(a)). The high quality of the public response demonstrated that the public understood the issues, analysis, and consequences.

NEPA further requires preparation of supplements to draft environmental statements if substantial changes are made in the proposed action that are relevant to environmental concerns, or if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. (40 CFR 1502.(c)(1)(i) and (ii)). The development of the new alternatives were responsive to public requests for more intensive analysis of differing themes of resource management; but none of them proposed actions substantially outside the range of alternatives previously considered, nor did they propose major changes in the underlying nature of the actions considered. Rather, they explored different emphases of management. Similarly, while the quality of information constantly improves with updated data, improved technology, and research findings, the changes between draft and final were insufficiently significant to warrant supplementation of the DEIS. As changes of significance occur, the Final Plan can be amended or revised, as appropriate, to reflect the new information.

The planning process failed to solicit adequate public comment on FORPLAN models and MMRs.

Response: Both FORPLAN and MRs were discussed in the DEIS and associated documents. A discussion of FORPLAN appeared in Appendix B, MRs were discussed in Appendix H, and both FORPLAN and MRs were discussed in Chapter II of the DEIS. These discussions provided information to allow responsive comment; and Forest Planning personnel were available throughout the comment period to provide further explanation and sources of information.

The formulation of MMRs without public input or formal rule-making procedures is not lawful, and their application plus other discretionary restraints before developing ASQ prevents the exploration of

a full range of alternatives not presented when applying MMRs, then discretionary restraints, before developing ASQ.

Response: The basis for development and application of management requirements (MRs) was discussed in Appendix H. The MR development process was in accordance with applicable Forest Service direction.

Standards and Guidelines

The documents fail to clarify the difference between standards and guidelines, including the extent to which each is binding.

Response: Chapter IV of the Forest Plan discuss the types of standards and guidelines that were developed, the nature of their operation, and the interrelationships between them.

The glossary defines "standards," "guidelines," and "standards and guidelines." It is best to view standards and guidelines together as an integrated methodology for achieving the purposes for which they were established.

As the standards and guidelines establish minimum or specific management requirements for the practices or lands to which they apply, they are binding. Some are more readily measurable than others. Taken together, the three types of monitoring (implementation, effectiveness, and validation monitoring) will help determine how standards and guidelines are being used and whether results are as were anticipated. If monitoring results or changed management situations suggest standards and guidelines need to be revised, then depending upon the significance of the indicated changes, the Forest Plan might either be amended or revised.

The documents fail to resolve conflicts between management direction, which will result in compromise to Standards and Guidelines when they limit timber sell levels.

Response: Each alternative considered provided a single vision of integrated management of the various resource values present on the Forest. Standards and guidelines are developed to meet the resource objectives of the alternatives, including mitigating measures that will guide the Forest Service in managing the Forest. Implementation monitoring will confirm the extent of compliance with standards and guidelines and the associated accomplishment, benefits, and costs. Effectiveness monitoring will confirm whether the practices and activities actually accomplish what was intended. Validation monitoring will confirm whether the relationships and assumptions used in the adopted Forest Plan are valid.

Monitoring is therefore the key to whether the "contract" with the public the Forest Plan makes concerning the implementation, effectiveness, and validity of standards and guidelines is actually met. The Forest expects to keep this "contract," and anticipated continuing public scrutiny further assures faithful adherence to Standards and Guidelines.

The standards and guidelines (Chapter IV of the Draft Forest Plan, "Forest Management Direction" under sub-heading D, "Forest Management Objectives") are, broad generalizations devoid of any quantification. These "standards and guidelines" fail to provide any basis for evaluation.

Response: The average annual outputs that are estimated to accomplish the goals and address planning issues, along with resource summaries and resource schedules. These provide the basis for further development of the annual program of work and budget, and they are intended to

be general in nature. The standards and guidelines and management area prescriptions, by contrast, are intended to provide specific direction about how activities and practices will be performed during implementation. While they do not make the project level decisions themselves, they provide appropriate direction to assure that those decisions are consistent with accomplishing the desired future condition.

The inconsistency with which standards and guidelines are framed is inappropriate: timber standards and guidelines are firm and allow little flexibility in meeting objectives. Wildlife guidelines, by contrast, are flexible and ambiguous.

Response: Standards and guidelines describe how activities and practices will be performed during implementation. Sometimes they describe only the minimums necessary to meet legal and regulatory requirements; sometimes they set stricter requirements to meet the objectives of a given prescription; occasionally they are waived if not applicable to individual management areas.

Often the nature of the resource values being protected or the state of the art concerning appropriate beneficial techniques is such that relatively greater flexibility in meeting legal requirements or specialized prescriptions is needed. In those cases such flexibility is intentionally written into the standards and guidelines.

The Standards and Guidelines have been completely revised in the FEIS and related documents, however. This effort reduced ambiguity by improving consistency in terminology and, where appropriate, provided less discretion in application.

Recreation

General

The DEIS and Proposed Forest Plan violate 36 CFR 219.21(e) by failing to coordinate the supply and demand of recreation opportunities with public agencies and other providers.

Response: The development of the FEIS, Final Forest Plan, and related documents used the projected demand rates for activities and existing supply opportunities from the State Comprehensive Outdoor Recreation Plan (SCORP). Meetings and other forms of involvement with State representatives, outfitters, and special use permittees provided a further basis upon which to predicate analysis. Discussions about Wilderness and recreation in Chapters II, III, and IV of the FEIS and the Resource Summaries in Chapter IV of the Final Forest Plan provide additional information.

Recreation use projections fail to be based on historical use trends of the Forest and demographic trends of locations that provide the majority of the Forest use.

Response: Historic use information has been updated in the Chapter III discussions of Wilderness and recreation in the FEIS. The principal basis for the projections of the next two decades is the State Comprehensive Outdoor Recreation Plan's treatment of the mid-Willamette Region. Bonneville Power Administration projections were the basis for recreation estimates in later years.

As with any remote projections of human behavior, unforecast changes may occur. The planning process is a flexible process; and should significant changes occur over the life of the Final Forest Plan, it may be amended or revised as necessary to reflect future needs.

Recreation use demands are inadequately addressed. Some specific examples are: The Draft Forest Plan fails to respond or meet future demand (5th decade) for developed and semiprimitive motorized and nonmotorized uses. Trail mileages are decreasing from the effects of clearcuts and roads despite increased use pressures. There is insufficient provision for access to Wilderness type experiences for physically challenged people. There is inadequate assessment of the need for more facilities such as corrals, hitching posts, camping areas, and parking to accomodate the increasing popularity of horse and pack animal use by the elderly and handicapped to access Wilderness and other undeveloped areas.

Response: Information has been updated and additional alternatives considered in the FEIS and Final Forest Plan documents. Several places in those documents address Wilderness and a variety of recreation-related matters. In particular: Chapters II, III, IV, and Appendices B, C, and E of the FEIS; and Chapter IV and Appendices A, B, and D of the Final Forest Plan.

Semiprimitive recreation capacity remains inadequate across all alternatives; but developed recreation meets demand in one alternative and developed recreation capacity (i.e. potential for future development) exceeds demand in several alternatives. About 100 miles have been added to existing trail mileages since the DEIS and continues to increase in several alternatives and the Final Forest Plan. Access by the disadvantaged to developed recreation sites and to Wilderness by outfitter guides have been addressed in the standards and guidelines (S&Gs). The S&Gs also require analysis of user interests and needs in determining what developed recreation opportunities will be provided, so that as the popularity of differing forms of recreation change (such as horse and pack use), changes can be made in the services and facilities offered.

The Draft Forest Plan fails to emphasize recreation to the level of the Chief's recreation initiative.

Response: The Chief's recreation initiative is a strategy aimed at meeting recreation needs through a variety of innovative techniques, including partnerships with other agencies and private organizations. Neither the terms of that initiative nor any specific output levels associated with it are themselves goals for Forest planning. Instead, the FEIS considered a broad range of reasonable alternatives specific to the capabilities of this Forest to produce outputs, including recreational experiences, according to certain management scenarios.

There is an inadequate discussion of the cumulative effects of harvesting on developed sites.

Response: The discussions of Recreation in Chapters III and IV of the FEIS address the effects of timber harvest in these areas. In many cases developed recreation sites are located in areas with scenic quality standards more rigorous than those found in general forest.

There are not enough developed sites to meet the demand.

Response: Currently installed capacity is inadequate to meet projected demand in the fifth decade, but the potential to develop sufficient sites to meet the projected demand level does exist (see the Recreation section of Chapter III of the FEIS). The range of alternatives address using the potential to develop additional sites in different ways. The Final Forest Plan addresses it in a manner such that projected demands for the fifth decade are met.

The documents fail to protect the values of Waldo Lake adequately by failing to limit motorized use on the Lake to administration, emergencies, and protection of the resources.

Response: Limiting boating on Waldo Lake to nonmotorized boats was within the range of alternatives which were considered. The Final Forest Plan allows the use of motorized boats on the Lake, but it does not propose changing the speed limit currently in force.

The documents fail to consider the use and funding of information centers along I-5 to interpret the resources and natural systems of the Forest.

Response: The Resource Action Schedules (Appendix D of the Final Forest Plan) address this.

The documents fail to evaluate the effects of plans to pave the road from the Waldo Lake area to Century Drive.

Response: This programmatic EIS makes no final decision whether to pave that road or not. The standards and guidelines for Facilities in Chapter IV of the Final Forest Plan provide that the road will remain a gravel surface road until completion of an environmental analysis determining the nature of any improvements or alterations to its current condition. This process will follow appropriate NEPA procedures, including the opportunity for public involvement.

The documents fail set use limitations based on well documented and defined carrying capacity of the resource.

Response: Chapter III of the FEIS provides an updated discussion. Process papers providing greater detail about the manner in which the capacities for Wilderness, dispersed recreation, and developed recreation uses were estimated are part of the Planning Records.

The planning documents fail to comply with the South Fork McKenzie Task Force Agreement by changing the Recreation Opportunity Spectrum category from semiprimitive motorized to roaded natural.

Response: The Forest did not accept the recommendations of the Task Force as such; however, the range of alternatives did consider the basic thrust of those recommendations. The Final Forest Plan retains a majority of the subject lands within the South Fork McKenzie Special Interest Area (SIA). This SIA will be managed in a manner consistent with the general theme of the Task Force's proposal.

Permits

Proposal to limit outfitters is squarely inconsistent with at least five different provisions of Chapter IV, Section B of the Proposed Forest Plan.

Response: The broadly phrased Management Goals are achieved through a number of different management practices. Outfitter guide services occur primarily within Forest Wildernesses and on designated or eligible Wild and Scenic Rivers. Limitations to commercial services in those areas are based on direction derived from the 1964 Wilderness Act and the Wild and Scenic Rivers Act of 1968 (Public Law 90-542). Of principal concern is the maintenance of the underlying character of the lands that led their designation as Wilderness or for protection of the free-flowing conditions and specific outstandingly remarkable values of the rivers. Refer to Chapter IV and Appendix A of the Final Forest Plan for management direction pertaining to commercial services.

The Proposed Forest Plan ignores trips conducted by guides which do not use pack animials.

Response: Most outfitter guide services are concentrated in Forest Wilderness. Forest management of commercial services focuses on the effects to natural resources from guided trips and the social benefits derived from those excursions. The primary considerations for accepting outfitter guide services in Wilderness rests not so much on the use or non-use of pack stock, but on the effects of guided activities on the resource, levels of usage, and the need to provide services to visitors who would not otherwise experience the Wilderness. Other criteria include consideration for guided services which are economical and provide high quality public service. Refer to Appendix A and the standards and guidelines for Wilderness in Chapter IV of the Forest Plan.

Nowhere has the recreational use carrying capacity of the Forest been addressed. Instead, the Forest is going to limit the use of public requiring services of an outfitter based on artifical, arbitrary, and unrealistic District by District hard number service day limitations without having identified the carrying capacity of the recreation resource.

Response: The recreation use carrying capacity in nonwilderness (both dispersed and developed recreation) is discussed in the Recreation section of Chapter III of the FEIS. Similarly, the carrying capacity of Wilderness is discussed in the Wilderness section of Chapter III of the FEIS and in the individual Wilderness management plans found in Appendix A of the Final Forest Plan. Service day use by outfitters in Wilderness is limited if data pertaining to the Limits of Acceptable Change or other management considerations indicate that recreational use is approaching the maximum levels outlined in the Final Forest Plan. Day limitations may therefore change over time as conditions change. See the standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan.

The proposed use of "bid and prospectus" as set forth on page A-12 in section 13(b) for outfitters violates Forest Service national policy set forth in the National Outfitter Policy.

Response: Forest Service national policy regarding issuing permits to outfitter guides can be found at FSM 2721.53, FSM 2343.8, and FSH 2709.11. That direction does not preclude the use of bid and prospectus in opening new commercial services.

The Draft Forest Plan fails to identify the role of outfitters: what they do, and who they serve. The Draft Forest Plan does not display a fundamental and correct understanding of the industry.

Response: Since most outfitter guides operate in Wilderness settings or on designated or eligible segments of Wild and Scenic Rivers, Appendix A of the Final Forest Plan is the principal place where their role and the contribution they make to the public is discussed. The role of commercial services relative to current recreation conditions and future trends on Wild and Scenic Rivers is discussed in Chapter III of the FEIS.

The Draft Forest Plan inappropriately singles out for disparity and second class treatment members of the public who depend on outfitters. You are discriminating against people who are unskilled, inexperienced, or are physically limited.

Response: The majority of outfitter guided excursions occur in Forest wilderness settings and along segments of designated or eligible segments of Wild and Scenic Rivers. One of the important considerations in permitting outfitter guide services in Wilderness is the ability to provide needed services to visitors who would not otherwise experience the Wilderness. See

Appendix A and management area standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan. In addition, standards and guidelines encourage outfitters to provide educational services.

Trails

The documents fail to consider the effect of adjacent harvest and bisection by roads on the 356 miles of nonwilderness trails that are claimed to be retained. The Plan is inadequate by failing to consider road and sale locations and other mitigating measures to protect these trails.

Response: Site specific project analyses will occur whenever project activities under the Final Forest Plan are proposed near nonwilderness trails. These analyses will consider various alternatives and their effects on the environment, including nearby trails as appropriate. The integrated trail and transportation system planning envisioned under the Final Forest Plan should minimize existing and future road crossings, as well as other conflicts between trails and roads. See Chapter IV of the FEIS and the standards and guidelines for Recreation (trails) in Chapter IV of the Final Forest Plan.

Riparian

The DEIS fails to address the consequences of the increased blowdown occurrences on water quality and fish habitat which occur as a result of increased clearcuts adjacent to riparian buffer strips.

Response: Chapter IV of the Final Forest Plan includes management area standards and guidelines for riparian areas. The potential for blowdown is one of the factors to be considered when determining the width of the riparian areas which are maintained. Some blowdown will inevitably occur, and these consequences are considered in the riparian vegetation section of Chapter IV of the FEIS.

The DEIS fails to list an indicator species for riparian area habitat.

Response: Management Indicator Species for riparian areas are resident and anadromous fish and are listed in Chapter III of the FEIS.

Maintaining the riparian areas in mostly young or early mature trees will not provide suitable in stream habitat.

Response: Discussions of the benefits of maintaining riparian vegetation can be found in the Fish section and the Water section of Chapter III of the FEIS. These discussions address the benefits to stream habitat provided by the retention of mature trees and large woody debris.

A range of management treatments to riparian areas is provided by the various alternatives. All of the alternatives, except NC, will meet or exceed the requirement to maintain viable populations. The Final Forest Plan recognizes the important role of mature vegetation in riparian areas to the quality of stream habitat. The result is that no programmed harvest occurs in Management Area 15 (Riparian) (see Chapter IV of the Final Forest Plan).

The statement is made that riparian areas will be maintained as habitat for riparian-dependent resources (DEIS, page IV-62). This is incorrect. The plans as presented will not provide the riparian benefits desired.

> **Response:** The extent of protection to riparian areas varies across the range of alternatives. The standards and guidelines for Riparian Areas (Management Area 15) in Chapter IV of the Final Forest Plan provide specific direction to protect riparian dependent wildlife species. There will also be associated benefits to other wildlife species such as thermal cover for big game and dead and decaying tree habitat for use by cavity excavator species. The Final Forest Plan provides more protection for those resources than the Proposed Forest Plan, by scheduling no timber harvest from riparian areas along streams and lakes.

The definition of riparian areas is incorrect, particularly the statement that they are approximately 100 feet. Riparian areas can vary in width from a few feet to more than a thousand feet in width. How will the "varying width" of riparian zones along Class I, II, and III streams be determined?

> **Response:** Standards and guidelines for Riparian Management Area 15 are found in Chapter IV of the Final Forest Plan. That direction provides for project level identification of riparian areas of varying widths, based on factors such as the needs for shade, streambank stability, input of large and small wood to the stream, unique riparian habitats, and other resource values.

The Forest standard for large woody debris (LWD) is inadequate for areas that have been entered for timber harvest. The standard needs to be "90% or more of potential large woody debris." What would be the cost of such a change in terms of lost timber production?

> **Response:** The cost of retaining mature trees in riparian areas compared to harvesting at the management requirement levels is described in the Management Requirement Appendix of the FEIS.

Demonstration of consistency with the Clean Water Act could be better shown by discussions of how the alternatives satisfy the requirements of the Oregon Forest Practices Act. Particular attention should be given to the newly adopted rules for riparian area management.

> **Response:** Information about compliance with the Clean Water Act can be found in the section discussing Water in Chapters III and IV of the FEIS. All alternatives include the use of Best Management Practices (BMPs). A list of BMPs can be found in Appendix H to the FEIS and by reference to the document *General Water Quality Best Management Practices* (1988). This document states that Forest Service practices meet or exceed the Oregon Forest Practices Act.

There appears to be no coordination of riparian management with overlapping allocations, except that the most limiting harvest rate applies. It seems strange to manage these areas the same whether the riparian area is in a high recreation zone with partial retention scenic or in a more limited recreation area.

> **Response:** In areas of overlapping allocations the most restrictive prescription applies. Riparian areas are recognized as a separate management area in the Final Forest Plan; and they carry relatively restrictive prescriptions, including no programmed timber harvest. The values for which riparian areas are managed are generally consistent with high quality recreational opportunities.

The discussion of the environmental consequences of the alternatives on wildlife failed to address riparian zone or associated species.

> The Riparian section of Chapter IV of the FEIS includes additional consideration of the effects of riparian area management on wildlife.

Research data necessary to provide or to develop quantitative criteria against which to measure effectiveness of the standards and guidelines does not exist. Research is needed to answer the Evaluation Question "Are riparian areas providing the expected diversity in wildlife habitat?"

> **Response:** Section II of the Final Forest Plan identifies a number of items for which additional information is needed. These include several items related to understanding riparian areas. As more is learned about the relationships between riparian areas and the diversity such areas can provide to wildlife habitat needs through effectiveness monitoring, the standards and guidelines and management area prescriptions may be changed.

The DEIS fails to delineate and provide adequate protection for riparian areas of Class IV streams.

> The management area prescriptions in Chapter IV of the Final Forest Plan incorporate specific direction for protection of Class IV streams. Management along these streams will provide for long term stream stability.

With 13 of 26 watersheds identified as having sedimentation problems, timber harvest of any kind in riparian areas would result in an unacceptable risk.

> **Response:** The Final Forest Plan eliminates programmed timber harvest from riparian lands and carefully limits other timber felling to accomplish specified purposes consistent with maintaining the integrity of the riparian areas. Future activities must be conducted in a manner to prevent further degradation, and as appropriate to provide rehabilitation of the watersheds.

The DEIS states "Most streams and rivers are considered deficient in large woody debris" (LWD). The DEIS fails to indicate how water quality, stream stability, and fish habitat can be maintained with a continuing net decline in LWD and other timber harvest impacts in riparian areas.

> **Response:** The Final Forest Plan ensures that large wood reaching the streams will not decline significantly by requiring that the supply of large wood be considered when planning activities in riparian areas. No timber harvest is programmed in these areas, and such harvest as is allowed occurs only after consideration of riparian objectives. In addition, stream habitat rehabilitation projects will provide increases of large wood to streams in critical areas.

The Draft Forest Plan suggests that timber in riparian areas, if harvested, would provide about 6% of the annual ASQ. What is foregone and what is gained by not harvesting in riparian areas? An alternative to answer this question should be developed.

> **Response:** The FEIS considers alternatives with varying rates of harvest in riparian areas, including Alternative W which proposes no harvest. The effects of these alternatives are considered in Chapter IV of the FEIS.

The extent of timber harvest in riparian areas is out of balance with riparian management prescriptions. Figure IV-D-22 of the Draft Forest Plan shows that over 300 MMBF will be harvested from riparian areas in the first decade. If only 10% of riparian areas can be in a harvested condition at any given

time (Draft Forest Plan, IV-62), then about 6300 acres are available for harvest from riparian areas. This area is reduced further by additional protections displayed in the Draft Forest Plan on LRMP IV-60 to 63. Is removing approximately 30 MMBF annually from less than 6300 acres likely? In addition, 5% of the proposed timber harvest is planned from riparian areas, and since riparian areas represent 5% of the Forest, it appears protection of riparian areas is inadequate.

> **Response:** An error was identified in the modeling of outputs from riparian areas in the DEIS. The estimates of timber available from riparian areas have been revised to portray more accurately the overlap of allocations within the riparian areas. This has resulted in a reduction of the volume estimated to be available from these areas. The change is described in the discussion of changes from Draft to Final in Chapter II of the FEIS.

Riparian widths of 400 feet on class I and 200 feet on class II and III streams have been identified for protection. Using these widths causes some 46,842 acres of suitable forest land to have the harvest reduced by 6%-38% in order to meet this constraint. The FEIS should explain why the Forest has chosen to exceed the Regional Guide direction on protection of riparian area vegetation and should clearly show the benefits of other less constraining riparian widths.

> **Response:** The Regional Guide directs Forests to develop prescriptions which will meet Management Requirements (MRs) for water quality, based on local conditions. In the Final Forest Plan, riparian areas are managed to maximize noncommodity outputs in addition to water quality (see the riparian management area standards and guidelines, Chapter IV of the Final Forest Plan). Field data specific to this Forest were used to formulate the prescriptions to meet MRs and the widths associated with them.

The first paragraph of the DEIS at page IV-57 describes the need for protecting riparian zones. The next paragraphs imply that the importance of these ecosystems is relevant only in certain alternatives. It would seem that if constraints developed to maintain the productivity of the soil and ecosystems is good in one alternative, it should be good in all.

> **Response:** The FEIS compares a number of alternatives for managing the Forest. While all alternatives will manage at or above legal minimum levels for water quality, the various alternatives place greater or lesser emphasis on the other aspects of the riparian ecosystem. The specific vision of the desired future condition which characterizes each alternative implies the necessity for differing management emphases between alternatives.

Page IV-57 of the DEIS states that all alternatives will meet the standards and guidelines." Figure IV-4-6 and Fig. II-E-15 show acres and harvest rates in riparian areas. When this data is balanced against constraints in the standards and guidelines, it appears that either timber harvest or the standards and guidelines will have to give.

> **Response:** An error was made in the DEIS in modeling timber outputs from riparian areas, resulting in overestimating the amount of timber produced from riparian areas. This modeling error has been corrected.

Roadless Areas

Many comments identified specific inventoried and uninventoried roadless areas for which protection or preservation was requested.

Response: Alternatives in the FEIS provided different ways and amounts of protecting or preserving the roadless character of currently unroaded lands. Alternative K proposed developing virtually all of the roadless areas, while Alternative L proposed protecting or preserving most of the current inventory. Other alternatives proposed intermediate levels of protection. Several levels of protection were also considered in the management prescriptions used in the FEIS, limiting roading, timber harvest, and motorized activities. Additional information about the effects of the alternatives on roadless characteristics of specific areas can be found in Chapter IV and Appendix C of the FEIS.

The Final Forest Plan represents the approach which is judged to provide for the multiple use and sustained yield of goods and services in a way that maximizes long term net public benefits in an environmentally sound manner. The Final Forest Plan increases the acres of roadless protection over the Draft Forest Plan.

Sensitive Plants

The DEIS failed to inventory sensitive plant species populations. This makes it impossible to determine adequately the risks associated with management activities and the locations where proposed activities might adversely affect sensitive species.

Response: The current inventories of sensitive plant populations need to be improved. The standards and guidelines in Chapter IV of the Final Forest Plan provide firm direction to ensure that inventories are completed as part of the biological evaluations for all projects that might adversely affect sensitive species. The Final Forest Plan funds inventories (Appendix D, Resource Action Schedules) and monitoring sensitive plant populations (Chapter V) in all management areas.

The documents fail to provide a goal statement for the protection and enhancement of sensitive plant populations and their habitat. The DEIS also inadequately documents the types and extent of management activities that might adversely affect these plants. For example, there is inadequate discussion of the role of logging, roading, recreation, livestock, and ORV use in the degradation of habitat and as vectors for the spread of competing nonnative or noxious weeds. Another example is that the effects of commercial collection of native plants on the maintenance of viable populations are inadequately addressed.

Response: All alternatives considered in the FEIS (except NC) were designed to maintain the viability of all native and desirable nonnative plants species, as required by the National Forest Management Act. A discussion of the role and potential effect of various land management activities has been included in Chapter IV of the FEIS. Alternatives W, D, and L were developed to emphasize various nonconsumptive values, including sensitive plant species.

The Final Forest Plan has a goal statement providing for the long term viability of plant species. Sensitive plants are considered in the Wildlife section of the standards and guidelines in Chapter IV of the Final Forest Plan. These standards and guidelines provide goals, objectives, and direction for the protection and enhancement of sensitive species, including the evaluation of the potential effects of forest management activities on these species. Appendix D of the Final Forest Plan programs funding for controlling the establishment and spread of noxious weeds. Finally, implementation and effectiveness monitoring provide the mechanisms through which viability threats and the need for appropriate corrective action can be identified.

The documents fail to provide a specific monitoring protocol for sensitive plant species.

Response: The monitoring plan in Chapter V of the Final Forest Plan has been revised to include a more comprehensive program for inventorying and monitoring sensitive plant species.

Soil

Soil data used to calculate surface erosion rates are based upon only 8 SRI mapping units out of over 150. Current erosion rates, the potential for future erosion, and cumulative impacts are all misrepresented by use of this inadequate data.

Response: Surface erosion data were assembled from several studies using a variety of techniques to consider a number of ground conditions and management treatments. The data were compiled by the research community, and they represented the best available data for comparing the alternatives. Moreover, the data are used as index numbers, providing implicit recognition that precise information on all conditions is not available.

Chapter IV of the FEIS discusses the effects of surface erosion and shows that it comprises a relatively small portion of total soil erosion when compared to the contribution made by landslides. The Forestwide standards and guidelines require that Best Management Practices be implemented to minimize surface erosion and mitigate its effect on beneficial uses (Chapter IV of the Final Forest Plan).

Monitoring of the implementation and effectiveness of the Forestwide standards and guidelines, as well as the results of new research studies, will provide additional information against which to judge the issue of surface erosion. As may be appropriate from such new information, the Final Forest Plan may be amended or revised.

The DEIS inadequately discusses the effects of management practices on long term soil productivity, particularly with respect to changes in the physical or biological soil components. For example, the loss of nutrients in clearcuts has been documented by Boreman and others but is not discussed in the DEIS. Similarly, the effects of repeated applications of fertilizer and pesticides upon soil quality and productivity has not been adequately assessed.

Response: The long-term impacts of timber harvesting and various vegetation management techniques on soil productivity are not yet completely understood. Some research would suggest that little harmful effects should be expected, provided proper forest management techniques are used. For instance, reports by Larsen, Harvey, and Jurgensen ("Forest Soil Biology -- Timber Harvesting Relationships," USDA Forest Service General Technical Report INT-69) address the importance of organic material in soils. The authors concluded that "no widespread detrimental impact on site quality can be directly attributed to harvesting effects on soil microflora." Research about soil productivity is far from over, however.

The section on Soils in Chapter II of the FEIS recognizes the need to maintain organic matter in the soils. Retaining woody material on-site is of course one way to provide this; but the optimal requirements for amount, size, decomposition class, and distribution of dead woody material remains unresolved.

Specific mitigation measures used to protect soils can be found in Chapter IV of the FEIS. The Forestwide standards and guidelines and in some cases guidelines for certain Management

Areas provide for direction to maintain soil productivity and minimize erosion (Chapter IV of the Final Forest Plan). Monitoring results will provide information to evaluate the effectiveness of these prescribed activities.

Figure IV-1-3 of the DEIS projects the equivalent of about 878 acre inches of soil will be lost or displaced from sites annually due to timber activities in the first decade. An approximate additional 230 acre inches per year would also be lost in road construction. This seems significant.

Response: The standards and guidelines in Chapter IV of the Final Forest Plan establish soil protection measures designed to limit detrimental effects on soils and to retain their long term productivity. Monitoring results will provide information necessary for determining whether these goals are being met and for evaluating possible corrective measures if the goals are not being met.

Erosion in clearcut areas is a function of slope and soil stability. In areas of steep slopes and unstable soils (e.g. Opal Creek), the rates would be greater than those expressed in the documents. Pollution due to soil erosion would certainly exceed the legal standards in the class III and IV streams in these areas (see Madej, McCashion and Swanson).

Response: The standards and guidelines (Chapter IV of the Final Forest Plan) provide direction for protection of soil cover to minimize surface erosion, as well as a number of measures to provide protection for water quality. State water quality standards will be accomplished through the use of Best Management Practices (BMPs). Monitoring will provide the information necessary to confirm compliance with the State standards or to evaluate appropriate corrective action to achieve compliance should the BMPs fail to accomplish what was expected.

Sediment and mass soil movement values are representative of areas currently roaded but seriously underestimate what will occur in the future as management activities occur on a greater number of sensitive sites. The sensitive watershed approach should also have been used in developing the fish model.

Response: The fish model included sediment as one of the influencing factors in determining smolt production. Project level analysis will consider the sensitivity of soils on a site specific basis in determining whether roading is appropriate. When the decision is made to construct roads, the standards and guidelines (Chapter IV of the Final Forest Plan) will prescribe the appropriate road construction Best Management Practices to minimize the risk of sediment and mass soil movement.

The high rate of erosion estimated in ALternative J would have a major detrimental impact on water quality, fish resources, and the future productivity of the soil. The Preferred Alternative J, is listed in Table IV-1-3 as having 31,000 cubic yards/year of erosion due to road construction. A review of professional literature indicates that a more commonly accepted value would suggest 100,000 cubic yards/year. The road erosion estimates by the Forest Service seriously underestimate the actual amounts that would occur with any of the timber harvest plans.

Response: Erosion rates vary significantly between geographic areas. The rates used in the FEIS analysis were derived from available research data for the erosion rates in this geographical area, and they provided suitable information for a comparative analysis of the alternatives. The actual decisions to construct roads will only be made after a site specific project analysis evaluating the specific area in question. The standards and guidelines (Final Forest Plan, Chapter IV) will

then prescribe the appropriate Best Management Practices to comply with State water quality standards so that beneficial uses, including the fisheries resources, are protected.

What is the current level of erosion and sediment production on the Willamette National Forest? What portion is management caused and how does the risk of erosion change by alternative? Are the standards set in Chapter 340 of the Oregon Administrative Rules?

Response: The Soils section in Chapter IV of the FEIS displays potential erosion and sediment related to natural processes and management activities by alternative. No absolute assurance is provided that all State standards (Oregon Administrative Rules, Chapter 340-41) are met and that all beneficial uses are maintained with the various alternatives that produce relatively higher sediment levels. The Final Forest Plan, however, projects that State standards will be met and there will be no significant adverse impacts to beneficial uses through the use of Best Management Practices (BMPs). Chapter IV of the FEIS discusses BMPs and the effectiveness of mitigation measures. The Watershed section in Chapter IV of the FEIS also provides information on the risk of potential sediment, allowing further comparison of the alternatives.

The rankings of the natural erosion component in Figure IV-2-2 do not correspond to the natural rates given in Figure III-E-8, and some of the reported averages are in error.

Response: The natural erosion rates presented in Table IV-2-2 of the DEIS included several transpositions of data. These errors have been corrected in the FEIS.

The Watershed Sensitivity Index may not predict true basin sensitivity to sediment impacts. One problem is the four factors are not independent of each other; for example, the discharge and elevation factors are strongly correlated (due to the importance of rain-on-snow events generating peak flows). This results in the Index being weighted towards basins which score high on these two factors.

Response: Several components of the Watershed Sensitivity Index have been changed. Chapter IV of the FEIS has additional detail.

The second paragraph of IV-26 of the DEIS states that the effect of increased peak flows are probably greatest if they occur in addition to increases in sediment load. This is not strictly true, since the increases may be compensating (i.e. greater sediment load is offset by increased stream power due to higher peak flows).

Response: Information on peak flows has been clarified in Chapter IV of the FEIS.

Erosion potential is rated severe on 73% of the Opal Creek roadless area but is only rated moderate in cumulative effects data. Quartz Creek, which is directly comparable, is rated severe in cumulative effects. Why is there a difference?

Data transpositions resulted in the inclusion of several errors in the Watershed Sensitivity Index of the DEIS. Chapter IV of the FEIS provides information on the revised Watershed Sensitivity Index.

Unstable areas need to be more precisely identified so the impacts of the alternatives on fish can be evaluated and priorities for fish habitat protection established.

Response: Lands with active mass movement have been classified as unsuitable for timber production, and have been removed from the land-base. Areas of Soil Resource Inventory landtypes

which are potentially highly unstable are mapped in the Land Management Planning Database, and the effects of management on these areas in included in the Watershed Stability Index. The Standards and Guidelines provide direction for assessment of lands which are potentially highly unstable, but not unsuited. Evaluation of potential impacts to any resource as a result of management activities will be done within a project level analysis. All proposed timber harvest units and roads are located and designed with direct involvement of engineering geologists, hydrologists, engineers, and soil scientists to minimize impacts on all resources.

Paragraph 5 of page IV-13 of the DEIS discusses ways to reduce the chances of mass movement when the harvest of timber on problem sites is considered. One of the ways to reduce mass movement included draining wet, unstable soils. Would draining unstable wet areas conflict with Executive Orders 11990 and 11988?

Response: The Wetlands Executive Order states that the values of the areas shall be assessed, and it lists factors which should be considered. Public safety and watershed resources are to be considered. The evaluation of whether any conflicts were present and the nature of those conflicts would be made during project level NEPA analysis.

Special Management Areas

HJ Andrews Experimental Forest

The Draft Forest Plan is in error when it states that the H.J.Andrews has been withdrawn from timber harvest: it has been and continues to be heavily cut over.

Response: The H.J.Andrews Experimental Forest is not part of the programmed harvest. Timber is harvested there for research purposes.

Oregon Cascade Recreation Area (OCRA)

Opening large areas such as the Oregon Cascades Recreation Area (OCRA) to ORVs constitutes a major and controversial federal action and should be accompanied by its own full EIS.

Response: A specific management plan, effective March 29, 1989, was written for the OCRA and management is in accord with the Oregon Wilderness Act. A small portion of the OCRA is open to off-road vehicle use, while the majority of it is closed to this type of use. Three Forests manage the OCRA. In that portion of the OCRA managed by the Willamette National Forest, motorized use is permitted on existing trails during snow-free periods and over the entire area when snow depths permit. Specific management direction can be found in management area 2b of Chapter IV of the Final Forest Plan. Other information can be found in Chapter IV of the FEIS and Appendix B of the Final Forest Plan.

Research Natural Areas (RNAs)

Present Research Natural Area (RNA) cell needs are not adequately addressed in the DEIS and Proposed Forest Plan.

Response: RNA cell needs in the Pacific Northwest are determined by a committee of scientists and managers at the Pacific Northwest Range and Experiment Station (PNW), and Forest scientists. All cell needs that this Forest is reasonably capable of supplying (e.g. this Forest is

not reasonably capable of supplying any cell needs for redwoods) have been considered. These are identified in Chapter III of the FEIS and arrayed by alternative in Chapter IV of the FEIS.

The Final Forest Plan was one alternative which included all cell needs this Forest was reasonably capable of supplying. These are named in the Resource Summaries section of Chapter IV of the Final Forest Plan; and the management area standards and guidelines for RNAs describes the manner in which they will be managed. Evaluation is an on-going process, and if reevaluation shows existing cell needs can be met or if additional cell needs are identified in the future, then they will be considered for establishment. If appropriate, the Final Forest Plan may be amended to include these new cells.

The documents failed to consider the extremely rare area running east of Iron Mountain as an irreplaceable resource for study on the subject of mixed forest and unusual associations.

Response: The Iron Mountain-Cone Peak area was not identified as a Research Natural Area need by the scientists at the Pacific Northwest Range and Experiment Station. In the Final Forest Plan 2432 acres of this area are allocated as a Special Interest Area (SIA) with botanical significance and afforded protection by the management area standards and guidelines for SIAs in Chapter IV of that document.

Special Interest Areas (SIAs)

The documents fail to address how the Forest will respond to potential threats to cultural resources that some developments could have in special interest areas.

Response: Federal laws and regulations require the protection of significant cultural and historical resources for future generations. The standards and guidelines for Cultural Resources in Chapter IV of the Final Forest Plan prevent the inadvertent harm or destruction to important cultural resources. In addition, Management Area 5a (see Chapter IV of the Final Forest Plan) direction requires preparation and approval of an area management guide which will provide direction for specific protection requirements, acceptable development and enhancement, and other uses and activities which are appropriate for the area.

SIAs are not adequately addressed and major cultural features are ignored in the Little North Santiam area. The Little North Santiam Mining District should be designated as a SIA.

Response: The Jawbone Flats area of the Little North Santiam Mining District has been determined eligible for listing in the National Register of Historic Places. This designation requires that both the Forest and private owners of these structures consult with the Oregon State Historic Preservation Office and the Advisory Council on Historic Preservation before making any changes to the attributes that led to that eligibility. Therefore, SIA classification for that area is unnecessary.

Other areas within the Little North Santiam Mining District were not designated on the National Register of Historic Places due to modernization of existing mining structures and lack of physical integrity. These areas are primarily of local historical importance.

The DEIS fails to provide adequate descriptions and maps of each (Special Interest Area (SIA).

Response: The SIAs are illustrated on maps of each alternative with numbers of acres, location by District, and types of classification indicated. Written descriptions and detailed maps of SIAs (1 administratively established, 48 potential) were too voluminous to include in the final document,

but are available through the planning record. Descriptions of potential SIAs are discussed in Chapter III of the FEIS, and the environmental consequences of the alternatives on SIAs are discussed in Chapter IV of the FEIS. Those areas designated as SIAs are described in Chapter IV of the Final Forest Plan.

There are inconsistencies between the DEIS and Draft Forest Plan: a) the Fall Creek Special Interest Area (SIA) was included in the Draft Forest Plan at IV-23 but is absent from the list of potential SIAs in the DEIS at III-151; b) the Oregon Central Military Wagon Road decreased in acreage from 2,688 acres in DEIS to 853 acres in the Draft Forest Plan without explanation.

Response: The omission of the Fall Creek SIA has been corrected in the FEIS. With respect to the Oregon Central Military Wagon Road, acreage differences can occur as a result of management decisions to allocate only portions of the available inventory in the Final Forest Plan.

Timber

Fertilizer

Page IV-3 of the DEIS states that fertilization "enhances soil productivity." This may be true over the short term, but it is widely known that chemical fertilizers disrupt vital biological activity in the soil. Ever increasing amounts of fertilizer are required to produce the same effects; associated chemical compounds from the fertilizers build up in the soil over time and cause increased salinity. The DEIS makes no mention of these effects or the adverse effects of fertilizer on fungus, moss, forbs, grasses, lichen, the rhizosphere in general, soil and water pollution, and plants and animals associated with riparian areas including fish.

Response: The application of 200 lbs/acre/ of nitrogen once each rotation (60-200 years) was approved by the Pacific Northwest Region for stands of 60% or more Douglas fir. The monitoring plan in Chapter V of the Final Forest Plan, along with the results of on-going research, will continue to provide information by which to evaluate potential adverse effects. The standards and guidelines in Chapter IV of the Final Forest Plan addresses the protections to water quality which will be observed during application of the fertilizer.

Some comments expressed concern about either too much or too little application of fertilizer. Some believed that the documents established timber harvest yields above the sustained yield capacity of the Forest, because fertilization was necessary to meet timber production goals. They felt it was inappropriate to rely on unproven future yield estimates based on fertilization that may or may not occur and may or may not produce predicted growth rates, concluding that sustained yield capacity instead needed to be based on natural growth rates. Others believed that the documents inappropriately limited the number of acres available for fertilization, the use of multiple applications, and the number of pounds applied per acre.

Response: Response to nitrogen fertilization has been proven through past research and application. Research continues to examine other aspects of fertilizer use, such as timing, amount, and the effects of multiple applications. The Forest has applied this information to the extent appropriate on a planning level in deciding the where, when, and intensity of fertilization. Where harvest levels based on intensified management practices occurs, they will be decreased no later than the end of each planning period if such practices cannot be completed substantially as planned (36 CFR 219.27(b)(5)). The monitoring plan will determine if the assumptions made in

the Final Forest Plan are accurate as to acres fertilized, intensity of fertilization, and response. If significant differences are identified, the Final Forest Plan will be amended or revised, or other action taken in conformance with the regulation cited above.

Harvest Effects

The DEIS fails to display the way clearcutting and reforestation mimic wildfire.

Response: This is addressed in Appendix F of the FEIS (Selection of Harvest Cutting Method).

The documents inadequately address the use of reductions in timber harvest, longer rotations, and alternative harvest systems (such as selective harvest systems and uneven-aged management) as the range of visual sensitivity increases from minor Forest roads to major highways and proposed scenic management areas.

Response: The section on Scenery in Chapter IV of the FEIS discusses the use of long-rotations, size, shape and blending of harvest units, as well as the use of uneven-aged management to meet visual quality objectives (VQOs). The VQOs reflect the changing visual sensitivity of various trail, road and highway corridors, as well as major viewpoints and recreation areas.

The rationale for even-age management is not clearly stated.

Response: Appendix F of the FEIS has been updated to provide more information on the selection of harvest systems.

Harvest Levels

The documents inappropriately hold down the allowable sale quantity (ASQ) by establishing rotation lengths longer than 95% culmination of mean annual increment (CMAI) on unconstrained acres. The documents fail to consider increasing ASQ or maintaining it on a smaller landbase in the age gap of the 6th and 7th decades by allowing earlier rotation ages on existing seeds/saps instead of carrying an average rotation age of 100 years after decade eight.

Response: The minimum rotation length allowed is set at 95% of CMAI, except in management areas with standards and guidelines that set longer rotation lengths. As a function of nondeclining even-flow, the FORPLAN model may be forced to hold stands beyond the minimum rotation.

The conclusion that this Forest's plan would emphasize timber was inappropriately made prior to conducting a full planning analysis, as evidenced by the timing and the manner in which the vegetation management issue addressed harvest volume assumptions.

Response: It is assumed that this comment refers to the Forest's use of the Preferred Alternative of the Vegetation Management EIS in the formulation of assumptions about the reforestation management techniques that would be used for the life of the Draft Forest Plan. Analysis and formulation of alternatives in the DEIS made use of the best information available about management techniques which would be utilized: at that time that information was found in the Preferred Alternative of the Vegetation Management EIS. The information has been updated in the FEIS to incorporate the Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation. In implementing the Final Forest Plan through project activities, the Forest will comply with the Record of Decision issued by the Regional Forester dated December 8, 1988, and the Mediated Agreement of May, 1989.

While it is true that under all analyzed alternatives, the intensity of vegetation management includes the entire range of silvicultural prescriptions available under the Record of Decision and Mediated Agreement, the relative emphasis on timber production varies considerably between alternatives (Chapters II and IV, FEIS).

The documents inappropriately include the recession years of the early 1980s when comparing the effects of the alternatives between themselves and the current plan.

Response: The documents have been updated to include the time from adoption of the current plan in 1977 through 1989. This period includes both the recession of the early 1980s and the near record harvest levels of the late 1980s. Both these extremes reflect conditions that tend to be common with the market over time.

The documents inappropriately compare amounts sold rather than amounts actually harvested.

Response: Both amounts are used for comparison. The Forest controls only the amount of timber sold. The harvest occurs at the desire of the purchaser within the time allowed by the contract.

The baseline period chosen for allowable sale quantity determinations was in error because it fails to consider years that accurately reflect demand for timber. Comparative estimates derived from the chosen period are therefore misleading.

Response: The baseline period includes both extreme highs as well as extreme lows. It is representative of demand.

Harvest Methods

The DEIS fails to consider all true costs to timber harvest, which results in fewer below cost sales than is actually the case. The Forest takes credit for the road system providing value as dispersed recreation and then closes these roads to the public.

Response: The procedures used to determine the costs of timber harvest discussed in Chapter III of the FEIS were developed in response to direction from Congress in 1984, with the help of the Government Accounting Office. Timber values and volume per acre on this Forest are such that below-cost sales have not been an issue. Road closures are used only when necessary for resource protection or public safety.

The documents inappropriately place decreasing reliance on the use of low-impact logging systems (e.g. helicopter, balloon, and horse logging to reduce dependence on roads; or one-end or full suspension of logs as a soil protection measure).

Response: The standards and guidelines (S&Gs) in Chapter IV of the Final Forest Plan provide the direction for appropriate levels of resource protection. The Final Forest Plan assumes that the mix of logging systems used in the planning period will be the same as used in the last decade. The actual decision about which logging system(s) will be prescribed to meet the S&Gs is a project level decision with appropriate NEPA documentation, and generally all logging systems will be available for consideration. If review of logging practices shows a shift from past use which results in significant differences in costs or outputs, the Final Forest Plan could be amended or revised.

The documents failed to present an alternative that considered in detail harvesting methods other than clearcutting, such as shelterwood, group selection, and other uneven aged management techniques.

Response: The method of harvest is a site specific decision that will be made at the project level. While very little group selection has been used in the past, other uneven aged management techniques and shelterwood cutting have been used to some extent. The assumption that was used for planning purposes was that the future use of these harvest methods would be proportional to past use. Monitoring results will provide information whether changes in these assumptions need to be made.

Harvest Scheduling

Appendix H-29 of the DEIS states an upper limit on created openings of 60 acres. No mention is made that there are exceptions to this rule as stated in CFR 219.27.

Response: Appendix H of the FEIS has been revised to include more detail, as well as making the reference clearer as it pertains to size of openings and exceptions.

The documents fail to meet the intent of the NFMA by cutting most of the Forest on short rotations (95% CMAI) in advance of full maturity.

Response: The use of 95% CMAI was in compliance with National Planning direction, FSH 2409.13, Chapter 30.

The DEIS fails to consider an alternative with long rotations, thereby establishing unnecessarily frequent entries with associated impacts.

Response: All alternatives include some amount of management areas carrying standards and guidelines to meet desired future condition where the rotations allowed are set for periods longer than the culmination of mean annual increment. These are displayed in Chapters II and IV of the FEIS.

Inventories

The documents fail to present important facts such as maps showing the present condition of the timber (what has been cut, the degree of planting success, and what remains to be cut).

Response: Information about the extent to which timber has been cut and what remains to be cut exists in tabular form in Chapter III of the FEIS. This information exists in a computerized form which is convertible to cartographic form in GMS, which is a part of the planning record. The degree of planting success does not appear in either tabular or cartographic form; but suitability determinations were based upon historic planting success at similar sites.

The productive capacity of the Forest is understated by 25% or more due to errors including: grouping of trees of different age classes, defect and breakage errors, inaccurate growth and mortality figures, out of date inventory, and plots aggregated to such a degree that normal forest practices cannot be modelled.

Response: The objective of this inventory was to develop statistically accurate data for pre-stratified timber types and size classes that could be mapped. It is important to be able to locate an area on the ground, for which yield tables have been developed and harvest schedules

have been planned. However, this method precludes the use of a post-stratified inventory process which can group plots by similar site characteristics, including age and site class. This allows the formation of strata with more detailed data and less variation, but which cannot be mapped.

The inventory was completed in 1981. The standing volume has been updated for use by FORPLAN by adding net growth from 1981 to 1994, and subtracting harvest through 1989. The results of a new inventory are expected shortly; if any significant changes occur, then the Final Forest Plan will be amended or revised, as appropriate.

The number of plots are insufficient and not stratified by site productivity or age class. The inventory needs to be reconciled with the FORPLAN suitable landbase. Overstory volume in shelterwood units was ignored, understating the standing inventory. The documents fail to compare old and new inventories as a check on growth assumptions.

Response: The inventory was designed to sample areas of the Forest that could be mapped into homogeneous stands by timber type and size class. Stand attributes like age class and site productivity cannot be mapped from aerial photos. The number of plots were calculated that would produce a sampling error within + or - 10%, which is the national standard (FSH 2409.13, Chapter 10). The inventory data has been reconciled with the Forplan data, both in terms of suited landbase and total standing volume.

The overstory volume in existing shelterwoods were sampled as part of the inventory, resulting in an accurate assessment of total standing volume.

The 1981 inventory did not consist entirely of remeasured plots from the 1971 inventory. There was not enough data to provide an accurate measurement of growth within the new Forest stratifications. The next inventory, scheduled for the early 1990s may be able to provide better data on growth. Based upon the results of that new inventory, appropriate review of the Final Forest Plan will be conducted to determine whether an amendment or revision should be made.

Inappropriate gaps in age classes occur because the model components were averaged, resulting in artificial problems with habitat diversity and the availability of stands for commercial thinning and final harvest.

Response: Mapping the Forest by timber type and size class did not provide good information on age classes of stands. Each strata has an average age resulting from the plot data, so all age classes are not represented. Between the DEIS and FEIS, the seedling and sapling stands were stratified into 10-year age groups, based on the year of harvest. This provided more flexibility in scheduling commercial thinning and harvest of these stands in the FORPLAN model. This in turn allowed more flexibility in the determination of allowable sale quantity and the application of water quality standards to timber sale scheduling, as well as additional information to analyze recovery times for wildlife habitat and manage scenic values.

Stratification of older stands (poles and larger) by age is not as critical as for seeds and saps. Diversity of habitat is more a function of size than age, once the pole category is reached.

By lumping all acres with stands over 220 years together, the documents fail to define clearly those older stands that are 400-800 years old. There are several areas of clearcut that are listed as large saw/old growth in the inventory.

Response: This situation has been addressed to the extent possible by separating large sawtimber stands from old growth. However, there is no way to further break down these size classes with the current inventory. The inventory maps and data have been updated to account for harvest that has occurred between the inventory and FY 1990.

The inventory failed to meet the 10% error in some strata.

Response: Each timber type and size stratum was designed to be sampled to a + or - 10% precision level at one standard error. The only exception was lodgepole pine which was sampled to a + or - 20% precision level. The timber estimates are statistically accurate at the stratum level and at the total or Forest level.

Land Suitability

The documents have made substantial errors in estimating the amount of land that should be included or excluded from the timber base. Some comments suggested that in excess of 10% of the land cataloged as unsuitable was in fact actually being managed as productive forest land. Other comments indicated that the suited landbase contained sizeable areas characterized by unstable soils, high erosion potential, and greatly increased risk of mass movement; these comments also indicated that some soil types were considered suited even though they contained substantial amounts of other soil types that were excluded from the base as unsuited.

Response: The Soil Resource Inventory (SRI) was done using high elevation photos and mapped at 1 inch = 1 mile. At this scale, areas of suited soil types contain inclusions of unsuited types. It is also true that the unsuited soils contain inclusions of suited types. The Forest is currently updating the SRI, using new, larger scale photos, and mapping at 2 inches = 1 mile. This effort is also incorporating on-the-ground mapping that has been done in the course of planning timber sales. If this new information results in significant changes to the suited landbase (+ or - 5%) the Forest Plan will be amended.

The Soil Resource Inventory relied upon by the documents is inaccurate with very little field verification. Of the 174,000 acres classified as unsuited, 85,000 acres have been incorrectly classified based on field reviews.

Response: The Soil Resource Inventory (SRI) is being updated and improved, and if the results of that update reveal significant changes to the suited landbase (+ or - 5%), amendment or revision to the Final Forest Plan may be needed. Even if the results of that update do not produce changes, advances in silvicultural technology may in the future allow changes in the classification of lands currently considered unsuited, leading to amendment or revision of the Forest Plan.

Review of the public comments did alert the Forest to a mistake in the application of the SRI being used for this planning analysis: four soil types were listed as unsuited, when only the actively unstable portions (landflows) were intended to be listed. This mistake was corrected in the FEIS and resulted in increasing the suited landbase by about 29,000 acres.

Reforestation and Timber Stand Improvement

Regional and Forest policies are overly lax and contrary to the National Forest Management Act (NFMA) (e.g. changes the word "insure" to "probable assurance" that land can be restocked within five years. The statement that restocking periods longer than five years may be planned as long as they do not affect the *capability* to reforest in five years misconstrues the NFMA guidelines.

Response: As a result of a lawsuit on the Bighorn National Forest, restocking periods longer than five years will not be planned under any circumstances. The five year period is measured from the time of final harvest. The standards and guidelines in Chapter IV of the Final Forest Plan further stipulate that the total time from first entry in shelterwood and seed tree harvests to successful regeneration, cannot exceed ten years.

The documents violate the National Forest Management Act five year regeneration mandate by including 80,091 acres possessing low potential for regeneration according to Soil Resource Inventory calculations.

Response: The monitoring plan in Chapter V of the Final Forest Plan will determine if the actual regeneration success meets the assumptions in the Final Forest Plan. Significant differences will result in appropriate corrective action, including possible amendment or revision of the document.

The documents inappropriately use assumptions which limit the amount of commercial thinning. They inadequately consider more intensive commercial thinning prescriptions such as earlier timing choices, more entries, and greater distances from roads. Yield tables require reexamination to determine whether one heavy commercial thinning can provide more volume to fill in the crucial age gap.

Response: Commercial thinning assumptions were based on estimates of the average condition necessary for a viable commercial operations, considering the earliest possible entry, distance from roads, and number of entries during a rotation. A prescription for one heavy commercial thinning entry was added to the list of options from which FORPLAN could choose in scheduling harvest.

The actual location and scheduling of commercial thinnings are site specific project level decisions with appropriate NEPA documentation. Silviculturists will write site specific prescriptions that schedule thins as early and as often as appropriate, and monitoring will continue to evaluate the effectiveness of those decisions.

TSI gains (release, genetics, fertilizer, precommercial thinning) are overstated in the yield projections.

Response: The projected benefits for timber stand improvement activities were based upon the results of existing research studies. Often some adjustments were required to fit species, the specific conditions on this Forest, or other details where the research results could not be directly applied. The process paper establishing yield tables provides more information on this subject and is available in the planning records.

The results of implementation and effectiveness monitoring will provide the data necessary to verify the accuracy of the projections and underlying assumptions. If indicated, appropriate corrections or Plan amendments or revisions will occur.

The documents have failed to substantiate the effects of animal damage on regeneration.

Response: The data on animal damage were used in the economic analyses of the various silvicultural treatments. The final mix of prescriptions assumes that appropriate measures will be taken to mitigate effects of animal damage on regeneration, with the result of no reduction applied to the yield tables.

Sustained Yield

The documents fail to propose cutting levels which can be sustained on a nondeclining basis. As the transition occurs from old growth harvest to smaller trees, a lower board foot to cubic foot ratio occurs, producing a declining yield in terms of board feet. Non-declining yield should be in terms of board feet and applied to the Timber Sale Program Quantity rather than the Allowable Sale Quantity.

> **Response:** 36 CFR 219.16 (a)(1) requires that the base sale schedule for any decade shall be equal to or greater than the preceding decade, provided that it is not greater than the long-term sustained yield capacity (LTSYC). This schedule is based on harvest occurring at culmination of mean annual increment (CMAI) which is required by 36 CFR 219.16 (a)(2)(iii) to be expressed in cubic measure. 36 CFR 219.16(a) requires that alternatives include determinations of the quantity of timber that may be sold each decade, meeting the management requirements of 36 CFR.27. 36 CFR 27(c) requires that the selected sale schedule provide the allowable sale quantity for each decade, without mention of the timber sale program quantity.

The inventory of standing trees decreases in every alternative except C, D, and ONRC, violating the principle of long term sustained yield.

> **Response:** 36 CFR 219.3 provides a definition of long term sustained yield, which in relevant part calls for the highest uniform wood yield from lands being managed for timber production that can be sustained under a specified management intensity consistent with multiple-use objectives. Uniformity of wood yield requires equilibrium between the production and harvest of wood. Many of the stands on the Forest have already passed the culmination of mean annual increment (CMAI) and therefore grow relatively slower than more efficient younger managed stands, so the Forest has not yet achieved this equilibrium. Various alternatives cut these older stands that have passed CMAI quicker and earlier (reducing their inventory) so that they may be replaced by the younger stands to achieve equilibrium between growth and harvest.
>
> The current growth rates on the Forest are relatively slow, due to the majority of acres in large sawtimber and old growth. In the early decades, this results in a drop in standing inventory on suited acres as timber is harvested. As the slow growing, older stands are replaced by fast growing, managed stands, this situation is reversed. By the fifth decade, growth is balanced with harvest, and the standing inventory is stabilized.

The measurement of timber volume in cubic feet rather than board feet actually results in reductions to timber production by the fifth decade which are not accurately represented in the DEIS and Draft Forest Plan.

> **Response:** It is true that when harvest is measured in board feet, a reduction occurs in the fifth decade, because the average size of trees becomes smaller as more second growth is harvested. Harvest measured in cubic feet, however, remains constant, and more accurately represents the amount of the tree that is being utilized.

Yield Tables

The documents inadequately explain and justify how the empirical yield model is appropriate for the Forest. The yield tables also suffer from a variety of problems. For instance, they have not been updated to show growth to 1994. There are signifcant discrepancies between empirical and inventory plot growth due to modelling errors. Defect and breakage deductions vary only by species and not by size class or age.

Response: A Process Paper is available which documents the Empirical Yield Model. The yield tables have been updated to reflect growth to 1994 in the FEIS. Adjustments were made in the FEIS to show varying defect and breakage according to species and size class, based upon a sample of recent timber sales on the Forest. In addition, an average age is calculated for each size class within a species group.

Managed yield tables beyond age 100 have severely reduced growth rates based on empirical yields. This is not appropriate given the problems with the empirical yield model.

Response: There are no yield models available that give satisfactory results for managed stands beyond 100 years. The gradual transition from managed growth rates to empirical growth rates (matched at common basal areas) provides a reasonable prediction of long-term yields on managed stands. Future inventories and the results of growth monitoring will provide much better data for developing more accurate yield tables in the future.

The documents fail to account for timber lost to fires. While some damaged timber may be harvestable, loss will be sustained and historical data is available from which to make statistical projections.

Response: The yield tables do account for incidental losses due to fire, based on the average number of acres burned per year. Losses due to catastrophic fires have not been considered, because they are assumed to produce such significant effects on forest resources that amendments or revisions to the Final Forest Plan would be required to account for the change in the forest inventory and age class distribution.

The documents failed to revise the empirical yield tables after discarding plots that fell in the new wilderness.

Response: An examination was made of the plots that fell in areas that became wilderness in 1984. There was not a significant difference in any of the strata between the plots in wilderness and the remaining inventory plots. No revision of the empirical tables was warranted.

The documents fail to comply with the National Forest Management Act's requirement that there be "tangible proof that intensive management practices actually produce the effects on timber growth projected by the agency". Any shortfall in anticipated increases in future yield would violate the concept of sustained yield.

Response: Much research has gone into developing the growth and yield models used to predict the allowable sale quantity and long term sustained yield capacity of the Forest. The models are based on actual measurements over broad areas, covering all the intensive management practices, in many combinations of site class, species, age, soils, and treatments. Monitoring results will provide the information necessary to evaluate the actual effectiveness of the measures taken and provide the springboard for appropriate corrective action, if indicated.

Visual Resources

The portrayal of visual management is misleading. Of the 410,411 acres of visual management, 300,349 acres provide 100% of full yield on rotations of 100 years or less. Thus 75% of the "visual" acres are a false representation of what will be provided, and the public's expectations will fail to be met.

Response: Management for visual quality is unique in forest management for its attention to matters of aesthetics. Standardization of aesthetic judgment is difficult if not impossible (or undesirable) to achieve, but desired objectives and results can be described with some degree of success. These visual management objectives (VQOs) are described in the section on Visual Management in Chapter III of the FEIS. Chapter II of the FEIS describes which lands are assigned specific visual objectives in each alternative, and the maps for the Final Forest Plan display this information more graphically for that alternative.

Frequently timber harvest can occur in a manner that is consistent with meeting certain visual objectives. The most important variables involve the rigor of the particular visual objective for the area, silvicultural practices, the period over which stands generate their highest average growth, and harvest rotations and techniques.

"Full yield" is defined as 95% of the culmination of mean annual increment (CMAI). CMAI is the point at which the incremental growth in tree or stand volume achieves its highest average value. This point can occur at varying ages depending upon the species of tree and the intensity of management, often between 80 to 120 years for douglas-fir/hemlock. Generally speaking, the span of time in which trees may continue between 95% and 100% CMAI varies between 20 to 60 years.

Consequently "full yield" is achieved consistent with the Visual Quality Objective of Modification through gradual rates of entry and associated gradual rates of change in appearance. In most cases even more rigorous VQOs may be achieved. Harvest rates for Modification Middleground is 12% per decade, resulting in 83 year rotations. Harvest rates for Partial Retention Middleground is 10% per decade, resulting in 100 year rotations. In contrast, "full yield" on a timber stand level might be very difficult to achieve on an area with a VQO of Retention.

A sensitivity analysis on the standards and guidelines is needed to show how scenic allocations affect allowable sale quantity and present net value.

Response: The evaluation of the effects of scenic allocations was reached through analysis of percent of full yield. A discussion of this evaluation can be found in Appendix B of the FEIS.

The effects displayed for viewsheds are in conflict with how the areas are allocated, and the process for evaluating the effects is unclear.

Response: The anticipated effects of management decisions on viewsheds were revised in the FEIS. The methods used to evaluate effects are discussed in Chapter III of the FEIS. The revisions to the effects analysis can be found in Chapter IV of the FEIS.

Scenic management prescriptions are vague and fail to constrain management activities.

Response: The standards and guidelines (S&Gs) have been revised for clarity and rigor. See the Forest-wide S&Gs, and as appropriate more specific direction consistent with particular objectives in various management area S&Gs in Chapter IV of the Final Forest Plan.

The scenic quality of certain areas is unsatisfactory. For instance, a scenic backdrop to Oakridge is a necessary component to its theme as a "Gateway to a Recreation Paradise," but the scenic quality of the surroundings are inadequately protected to attract tourists and residents. Another example is that every mile of every major highway was allocated to the programmed harvest under the Proposed Forest Plan.

Response: In response to public comment, some revision of scenic management allocations occurred between the DEIS and FEIS. See the maps for the Final Forest Plan to identify specific locations and the nature of those changes.

In the case of the viewsheds for major highways, many different management areas and scenic prescriptions may be traversed, including reduced harvest and no harvest areas such as Riparian, Special Wildlife Habitats, Special Interest Areas, or Wild and Scenic River management areas.

The Proposed Forest Plan's treatment of foreground highway visuals fails to satisfy the requirements of NEPA, including but not limited to the sections assuring all Americans of an aesthetically pleasing environment, preserving important natural aspects of our national heritage, and ensuring that unquantified amenities and values be given appropriate consideration.

Response: In accordance with NEPA and NFMA, a broad range of reasonable alternatives were developed to provide an adequate basis for identifying the alternative coming nearest to maximizing net public benefits, consistent with resource integration and management requirements. The entire FEIS and accompanying Appendices, but particularly Chapters II, III, and IV provide broad disclosure of the affected environment, the alternatives, and the environmental consequences of those alternatives. The consideration given to scenic, cultural, and unquantified amenities is detailed throughout the FEIS and Final Forest Plan documents.

FORPLAN inadequately modeled scenic resources by failing to: use a cutover yield that tracks recovery of cutover areas instead of a decade harvest rate constraint; loosen harvest constraints after the first decade as a reflection of decreased sensitivity to harvest; formulate first decade constraints the same as for decades 2-15.

Response: There are various ways in which scenic resources can be modeled. The decade harvest rate constraint better prevents fluctuations in rates of harvest that might otherwise occur during modeling under the present net value or maximum timber harvest objective function. The more gradual rate of entry that would be expected by the decade harvest rate constraint when compared to other modeling techniques such as cutover yield should prevent dramatic disruptions of scenic values.

The proposition that people become desensitized over time to significant changes in landscape appearance such that they can tolerate increasing rates of change presumably would be equally true about the degradation of many resource values, whether dirty rivers, dirty air, or even vanishing species, because the baseline for comparison constantly changes. Much as watershed and airshed management work from baseline information to assess acceptable levels of change and effectiveness of mitigating measures, so too viewshed management needs to be anchored to baseline quality levels that do not fluctuate or continually erode.

First decade constraints differing from those in later decades were formulated to allow as needed the restoration of existing conditions to meet Visual Quality Objectives. The standards and guidelines in Chapter IV of the Final Forest Plan provide the specific direction.

Water

Data, Statistics, and Method

Failure to use the Forest's watersheds as the basic building blocks of the DEIS and Draft Forest Plan resulted in failing to recognize the importance of the watersheds and renders the analysis used inadequate to support the conclusions made.

> **Response:** The FORPLAN model used to analyze alternatives for the FEIS was changed to incorporate watershed identifiers to increase the accuracy of the assessment. See Appendix B and the section discussing changes between draft and final in Chapter II of the FEIS.

Treating the issue of riparian zone harvest at the project level precludes planning for recruitment of large woody debris of different sizes, ages, and species composition into the entire stream channel over the course of a rotation. Planning needs to be done on at least a watershed to subdrainage scale.

> **Response:** The standards and guidelines in Chapter IV of the Final Forest Plan include direction for assessment of riparian conditions at a watershed scale.

The Forest made significant deviations from accepted standards in the application of statistics to the data. For example, at B-62 in the Appendices to the DEIS, it is stated that "in some cases where it was felt that rates from individual boxes were high and not characteristic of the site, the boxes were not averaged with the others." On the same page, a reading of the last paragraph seems to indicate that one study on one site formed the basis for assumptions concerning recovery rates from erosion.

> **Response:** The researchers who provided the data upon which the Forest relied concluded that:
>
> > It is reasonable to exclude these samples from the description of general conditions because [these sites] were selected to provide estimates of maximum rates of surface erosion for forested conditions. These sites had slopes of 80% to 100% and 5 of the 6 had ground cover of less than 100%. (Swanson and Grant, 1982)
>
> Only one study had been monitored for more than 10 years, so assumptions were made to derive decadal averages. The estimates used were made by professional researchers using the best available information. Future validation monitoring will verify the degree of accuracy of these assumptions.

The DEIS and Draft Forest Plan lack sufficient information to establish an adequate assessment of baseline water quality conditions in individual streams and therefore to assess the effects of planned activities near those streams.

> **Response:** The baseline soil erosion rates used in the analysis provide an indicator of baseline water quality. More direct baseline water quality data will be obtained by monitoring as outlined in the Final Forest Plan, including the provision for monitoring stations in subdrainages which have had no management activities. These control watersheds will provide baseline data on unmanaged conditions which will be useful in meeting effectiveness and validation monitoring goals.

Page III-17 of the DEIS states that the total water yield from the Forest is 8.4 million acre-feet/year, yet table III-E-7 on page III-27 of DEIS shows 8,895,098 acre-feet/year. Which is correct?

Response: The statement on page III-17 of the DEIS is in error. This should read 8.9 million acre-feet per year. The section on Water in Chapter III of the FEIS was revised accordingly.

Fog drip is an important factor not considered in the Draft Forest Plan. Fog drip can add up to 30% to total precipitation, and is important in certain topographical regions and features. Conservation of old growth in these areas is necessary to generate and store precipitation.

Response: Water yield and timing are discussed in the section on Water in Chapter III of the FEIS. It is true that some research results have shown that the harvest of old growth with its corresponding reduction in fog drip can result in decreased water yield in localized areas of Northwest Oregon. Despite these findings, no change in water yield is projected for any alternative in the FEIS. This is because harvest areas are mixed with unharvested and reforested areas, so the temporary decrease in fog drip in harvest areas is insufficient to result in any significant increase in stream flow from large watersheds.

The Forest Service plans to use the hydrologic recovery concept for assessing cumulative effects in watersheds. In addition, an inventory of all slope movements (debris, fill, cut, other) along with probable cause should be developed. This would help further define whether adverse cumulative effects would be generated by timber removal or road construction. By looking at the type of movement versus the Soil Resource Inventory mapping unit, one could predict the probability of occurrence as well as the type of landslide movement.

Response: Appendix B to the FEIS includes additional detail on the analysis of cumulative effects. The concepts discussed in the comment are included.

The information displayed in the DEIS for the Little N. Fork of the Santiam and Quartzville Creek appears to be nearly identical as to stream class, mileage, size, water yield per square mile, and natural rate of erosion. Despite these close similarities, the Little N. Santiam is assigned "moderate" sensitivity and Quartzville Creek is rated "high." Why is there a difference?

Response: Sensitivity assessments have been modified. Further detail can be found in Chapter IV of the FEIS.

The Watershed Sensitivity Index (WSI) only indirectly addresses a number of key factors, including: 1) the channel's efficiency at transporting material; 2) the sensitivity of the channel to changes produced by sediment transport; and 3) sources of erosion other than surface or shallow mass movement. The Index should be improved to adequately identify "sensitive" basins or reaches within basins; otherwise, there is no way of knowing whether ratings for basins need to be changed.

Response: Detailed assessment of sediment transport and channel sensitivity for over 1300 miles of perennial streams is not possible with state of the art models. Such an assessment would be more appropriate a smaller scale, but methods have yet to be developed. Monitoring will provide information on whether the goals and objectives stated for water quality and riparian areas are being met. The need for improved cumulative effects models is identified as an information need in Chapter II of the Final Forest Plan.

Effects of Management Practices

Soil and water resources should be managed to exceed Management Requirement (MR) levels and the Draft Forest Plan fails to emphasize improvements to these resources.

> **Response:** Management at the MR level meets legal requirements. A range of alternatives are considered by the FEIS, providing different levels of protection and enhancement to the soil and water resources. The goals of Alternative W, which is developed more fully as the Final Forest Plan, includes managing riparian areas above MR levels, conservative management of potentially highly unstable land areas, and strict implementation of Best Management Practices.

Increased potential for flooding and associated costs are not adequately addressed in the Draft Forest Plan.

> **Response:** The Final Forest Plan includes provisions for minimizing damage of flooding by considering the cumulative effects of timber harvest on streamflows. In addition, enhancement or corrective projects will be scheduled to reduce risks associated with existing conditions which present substantial risk for flood damage.

There is inadequate discussion supporting the statement in the DEIS at IV-76 that instream work is costly and can have potentially detrimental effects on other beneficial uses.

> **Response:** Costs of instream projects are available based on projects which have been conducted on the Forest during the past five years. The potential detrimental effects on other beneficial uses are generally related to the temporary disturbance of streambanks which may result in temporary sedimentation and reductions in soil cover, with potential adverse effects on fish habitat.

The DEIS fails to assess the possible effects of fertilizer runoff on water quality in streams.

> **Response:** Chapter IV of the FEIS provides this assessment.

The DEIS underpredicts water quality impacts, particularly in roadless areas which tend to be classified as having severe erosion potential. This is because the data used for the calculation of surface erosion rates were based on eight sites in the H.J. Andrews Experimental Forest and one other site located near Ryder Creek, which are not representative of large portions of the Forest, including many roadless areas. A supplement to the DEIS is therefore needed.

> **Response:** Predictions of the effects on water quality in the FEIS and Final Forest Plan include the assumption that Best Management Practices (BMPs) will be consistent with the identified risks and be strictly implemented to limit adverse effects. BMPs for activities undertaken on Soil Resource Inventory landtypes described as having "severe erosion potential" will minimize disturbance of the protective duff layer and to minimize delivery of sediment to the stream by retention of rough material such as slash or vegetation adjacent to the streams. The erosion rates used were adequate for purposes of drawing comparisons between the alternatives; supplementation of the DEIS is not required.

The DEIS is deficient in failing to fully explore the adverse effects of commercial thinning on soil erosion , watershed condition, and stream sediment level.

Response: The discussion in Chapter IV of the FEIS considers the effects of commercial thinning on soil erosion, watershed condition, and stream sediment levels.

It is apparent that roads will continue to affect water resources significantly. In view of these impacts, the Forest should be more explicit about mitigation measures. For example, a discussion of any road closure program would be helpful. Similarly, the road design mitigations described on DEIS IV-37 should be included as standards and guidelines (S&Gs).

Response: The Water Quality S&Gs in the Final Forest Plan include direction specifically for road construction. In addition, the Resource Activity Schedule in Appendix D of the Final Forest Plan summarize rehabilitation projects.

Long-term watershed capabilities are not addressed. What are the effects of many cuts within a watershed?

Response: The cumulative effects analysis in the Water section of Chapter IV of the FEIS includes an assessment of many timber harvest units within a watershed.

It appears that the dispersion constraints necessary to achieve or maintain hydrologic stability are 20%, 25% and 30% for high, medium, and low sensitivity watersheds, respectively. These dispersion constraints are never enunciated. A listing of the watershed dispersion constraints under which the Forest will operate should be provided.

Response: The watershed constraints have been revised in the FEIS. They are detailed in Appendix B of the FEIS.

Achieving and maintaining hydrologic stability in forest watersheds should be a goal of all alternatives in the Final Forest Plan. An explicit array of Forest activity information by watershed, along with the volume or value of timber in each, would provide a valuable yardstick by which to measure the cost of achieving hydrologic stability.

Response: The FORPLAN model used in the FEIS provides estimates of timber outputs by watershed, with some controls to distribute harvest according to watershed sensitivity. The cost of achieving hydrologic recovery was not specifically analyzed, because of the interaction with other modeling constraints.

Erosion, Sedimentation, Temperature, and Turbidity

The description of rain-on-snow events could be strengthened by additional references that were published after the DEIS was printed: Harr, R. Dennis. 1986. "Effects of clearcutting on rain-on-snow runoff in Western Oregon: a new look at old studies." *Water Resources Research* 22(7):1095-1100.

Response: These references were reviewed and considered in the analysis for the FEIS. They appear in the bibliography.

Provisions for stream surface shading are unclear. Also, stream sedimentation or turbidity standards and guidelines are not specific and cannot be measured.

Response: The standards and guidelines (S&Gs) have be rewritten to provide additional clarity and specificity. The S&Gs in Chapter IV of the Final Forest Plan require compliance with the Clean Water Act for the protection of the waters of the State of Oregon. Experience

on the Forest shows that by implementing Best Management Practices (BMPs), water quality and fish habitat will be protected. The water quality and fish habitat monitoring program described Appendix E of the Final Forest Plan provides the basis for evaluating the effectiveness of BMPs and ultimate compliance with State water quality standards.

The Preferred Alternative must provide remedial actions to correct the problems in those streams with identified temperature and turbidity problems.

Response: The Standards and Guidelines include direction to implement watershed enhancement projects where State water quality standards are not being met, or where there is a high risk of them being violated due to existing conditions.

Turbidity analysis must be done for streams in watersheds in which the Forest Service plans timber harvesting activities. This analysis may reveal turbidity values 10% or more above natural levels. Timber harvest in such a degraded watershed would require an exemption from the Oregon State Department of Environmental Quality.

Response: Final Forest Plan monitoring is designed to determine whether Best Management Practices are effective in meeting State water quality standards.

The DEIS assures water temperatures will not be compromised (DEIS, p. IV-36, H-21-22), but there is no explanation of how this can be the case when 83% of riparian areas will be logged. The Draft Forest Plan's riparian area scheduled logging appears to contemplate a violation of State instream temperature standards.

Response: Detail about the ability of the various alternatives to meet State water quality standards can be found in Appendix G. The Final Forest Plan includes direction that riparian areas shall be managed in order to meet State water quality standards, including temperature standards. No timber harvest is programmed from these areas.

Cumulative effects of erosion, mass wasting and compaction on soil and structure are inadequately addressed.

Response: Chapter IV of the FEIS now addresses these considerations in greater detail.

Cumulatively, Class IV streams provide benefits to Class I through III streams through flood-flow storage and erosion protection. The Forest should consider a greater level of protection for these Class IV streams as well.

Response: In recognition of the essential role Class IV streams in the protection of downstream waters, the standards and guidelines for the Final Forest Plan have been revised to provide specific direction for the protection of Class IV streams.

The cumulative effects rating suffers the uncertainty that current or potential impacts are only assessed indirectly through a calculated increase in erosion and a hydrologicial recovery factor. There is no real measure of past or intrinsic basin "response" to use as a yardstick for evaluating potential future response to alternatives.

Response: The cumulative effects rating is based on information available and the scale appropriate to forest planning. The scale of the analysis precludes very detailed evaluation of the myriad of local conditions involved in determining the intrinsic basin response. Cumulative

effects models have been identified in the "Information Needed" section of Chapter II of the Final Forest Plan.

At least 39% of the Forest would be in a hydrologically unrecovered condition under the Preferred Alternative in the DEIS (i.e. less than 75% of the area in trees of 8 inch diameter or greater; see DEIS at page IV-34). This is not in accordance with the management consideration described in the DEIS at page III-17 which states that watersheds will be maintained at 75% hydrologic maturity.

Response: The Forest will maintain levels of hydrologic recovery compatible with maintaining stream stability. The Final Forest Plan includes standards and guidelines in Chapter IV to distribute harvest according to subdrainage sensitivity. This was modeled in FORPLAN.

Groundwater

The document should address the subject of water supply, including groundwater, indicating measures to prevent and mitigate impacts on this resource.

Response: An expanded discussion of groundwater and more generally the supply and demand for water can be found in the section on Water in Chapter III of the FEIS. All alternatives include the use of Best Management Practices (BMPs) for the protection of water quality (FEIS, Appendix H). Specific BMPs provide for safe drinking water and the management of sanitation facilities.

The effects of timber harvest, recreation, grazing, and vegetation management on groundwater recharge should be addressed.

Response: The current condition and effects of management practices on groundwater is discussed in Chapters III and IV of the FEIS. Current research on the effects of forest management does not indicate a strong relationship between the removal of timber and road construction with groundwater problems. The primary area of groundwater recharge is the high Cascade plateau above 4000 feet. The majority of this area is designated wilderness precluding significant management activities.

The DEIS fails to provide an adequate discussion of how groundwater on the Forest will be protected. Such a discussion should include sewage disposal practices at primitive and developed sites; the effects of any municipal or industrial solid waste or sewage effluent; and chemical handling practices including herbicides, pesticides, fertilizers, and degreasing solvents at maintenance shops.

Response: The discussion of what is known about groundwater on the Forest has been expanded in the section on Water in Chapter III of the FEIS. The use of Best Management Practices (BMPs) is included in all alternatives (FEIS, Appendix H). BMPs include requirements for the management of sanitation facilities and the control of refuse disposal. The BMPs also require all chemical handling conform with the Forest's Spill Prevention and Response Plan which complies with the State Department of Environmental Quality regulations for the protection of groundwater. As appropriate, the effects of discharge at specific sites will be evaluated in project level environmental assessments.

Standards for Water Quality

Management activities conducted on the Forest must be consistent with Oregon's adopted Statewide Water Quality Management Plan, and Oregon's adopted Water Quality Standards should be incorporated

into the Plan by reference. The FEIS should describe how Management Requirements (MRs), standards and guidelines (S&Gs), Best Management Practices (BMPs), and other measures designed to minimize water quality impacts from Forest activities will ensure consistency with the State's antidegradation policy.

Response: The requirement under the Clean Water Act is that the Forest's activities comply with approved State water quality standards. The strategy used in this Final Forest Plan to achieve compliance was to require the use of BMPs; and then through monitoring assure not only that these BMPs were being used, but that they actually produced the compliance with the water quality standards that was anticipated. In the event monitoring reveals that water quality standards are not met, appropriate corrective action will be identified and implemented. A list of the BMPs is contained in Appendix H to the FEIS and interested readers are further directed to the document entitled *General Water Quality Best Management Practices* (1988) which is a part of the Planning Record. Appendix E of the Final Forest Plan describes the water quality and fish habitat monitoring programs which are the bases for the monitoring program described here.

The documents fail to consider scientific studies of Waldo Lake which have demonstrated that the use of motor boats on the lake are affecting water quality.

Response: The quality of water in Waldo Lake remains of continuing concern to the Forest. The Final Forest Plan makes no changes in the current use of motor boats on the Lake; however, the monitoring plan in Chapter V of the Final Forest Plan provides for monitoring water quality in the Lake. Appropriate site specific analysis and public involvement will occur before a decision is made to eliminate the use of motor boats on the Lake.

Page IV-31 of the DEIS states that watersheds assigned a "probable" risk rating have a high risk of cumulative downstream effects on water quality, physical stream characteristics, and fish habitat as a result of planned management activities if a 10 to 20 year rain-on-snow flood event were to occur. As the Forest's planning cycle is for a period of 10 to 15 years, there is a high probability that such a 10 to 20 year rain-on-snow event could be expected to occur, so it is very likely management induced declines will take place for each watershed rated "probable." The Draft Forest Plan rates about one-third of the Forest's watersheds as "probable," and therefore vulnerable to such management induced declines in the amount and relative long term stability of existing beneficial uses. Not only is this result unacceptable, it violates applicable law (National Forest Management Act, Clean Water Act), State of Oregon water quality standards, and criteria established by the Oregon Department of Fish and Wildlife. The Forest Plan must redistribute activities to lessen cumulative watershed effects risks. The range of alternatives must present a scenario where no watershed falls into the "probable" category.

Response: Modeling changes in the Final Forest Plan were revised to provide increased protection for watersheds. No watershed in the Final Forest Plan is projected to have a high risk of management induced decline. This accomplished by various strategies required by the standards and guidelines, such as scheduling timber harvest according to subdrainage sensitivity, maintaining full protection of riparian areas, conservative management of Class IV streams and potentially highly unstable land areas, and the use of highly effective Best Management Practices for roads.

The documents should address the development and scheduling for implementation of municipal watershed agreements with the larger municipalities relying on the Willamette watershed.

Response: As discussed in Chapter III of the FEIS, the quality of water delivered to the withdrawal facilities for the watersheds with 100% Forest land (generally the smaller municipal watersheds) has been sufficiently high that the Forest has not been approached to develop formal municipal watershed agreements. The larger municipalities also benefit from this same high quality water, but the quality of water delivered to them additionally depends upon management practices of a number of other, typically downstream, public agencies and private landowners.

The Forest's commitment to comply with State of Oregon water quality standards should assure continued delivery of high quality water consistent with beneficial uses from Forest lands. If municipalities approach the Forest with specific concerns, the Forest would work with them to explain practices, provide data, and develop appropriate solutions.

Under EPA-proposed rules required by the 1986 amendments to the Safe Drinking Water Act (SDWA), an agreement must be reached with the Forest Service that would allow the municipalities to have watershed control in order to continue to use water sources without filtration.

Response: The SDWA states that to receive an exemption from filtering surface waters, municipalities must demonstrate that they have an agreement with landowners of the supply watershed. Public water supplies are one of the most important beneficial uses recognized in the Final Forest Plan. Standards and guidelines in Chapter IV of the Final Forest Plan provide direction to maintain water quality which meets the needs of beneficial users. The Forest will work in partnership with municipalities to provide clean water for public use.

Water Quality Monitoring

It seems that less than one-tenth of 1% of the projected first decade annual budget will be allocated to the monitoring effort. Given the importance of water quality and riparian areas, greater attention in terms of staff and resources seems warranted to provide information as soon as possible about whether the Plan is providing the water resource protection intended.

Response: The projected budget amount for water quality monitoring has increased since publication of the DEIS (see Chapter V of the Final Forest Plan). The factors that are of critical importance are that a good monitoring plan is developed and adequately funded, rather than exactly how many dollars are involved. The monitoring plan has been revised to provide a comprehensive, efficient monitoring program. Additional monitoring detail will be developed in cooperation with the Environmental Protection Agency and Oregon Department of Environmental Quality.

If effectiveness monitoring does not occur on all watersheds, how will the watersheds which will be subject to effectiveness monitoring be prioritized and chosen?

Response: Watersheds will be prioritized for monitoring based on the importance of the beneficial use and the sensitivity of the land and stream to changes resulting from management practices. High priority will be given to sites identified in the Oregon Department of Environmental Quality's "Clean Water Strategy" which addresses nonpoint pollution.

The monitoring and evaluation program proposed in the Draft Forest Plan will do neither. It is inadequate to document the changes occurring throughout the Forest or to identify the causative agent(s) for those changes. A detailed water quality monitoring plan should be based on a list of current beneficial uses, present condition, and the desired future condition for each stream or watershed unit which can effectively contribute to protect the beneficial uses. The monitoring plan should include types of surveys,

location of sampling, parameters to be monitored, indicator species, budget, procedures for using data or results in plan implementation, and availability of results to interested and affected groups. The Final Forest Plan should increase the number of water quality and flow stations, the number of habitat and riparian index areas, and the intensity of the sampling.

> **Response:** Chapter V of the Final Forest Plan outlines a revised water quality monitoring plan that was developed in cooperation with the Environmental Protection Agency and the Oregon Department of Environmental Quality. These agencies will be consulted when developing additional detail for the monitoring plans, including identification of an adequate number of monitoring stations. The monitoring plan includes information on the parameters to be monitored; the type, location, and frequency of sampling; and availability of monitoring information.

The goal of monitoring should be to assess the changing water quality conditions, rather than the implementation of Best Management Practices (BMPs).

> **Response:** Three types of water quality monitoring may occur under the National Forest Management Act: implementation, effectiveness, and validation monitoring. Since BMPs are the methods used to assure compliance with State water quality standards, implementation monitoring is essential to be assured that BMPs are actually used. Effectiveness monitoring will also occur to assess whether the required practices provide water quality that meets standards. As appropriate, validation monitoring may also occur in response to the monitoring questions to test the validity of the relationships and assumptions used in the Final Forest Plan.

The impacts presented in the Plan are not adequately addressed by the water quality monitoring plans. Class III and IV streams should receive monitoring to help prevent adverse cumulative effects on Class I and II streams.

> **Response:** The monitoring plan has been revised (Chapter V of the Final Forest Plan). It includes monitoring of representative reaches of Class III and IV streams in the monitoring outline "Aquatic Habitat and Stream Stability."

Wild and Scenic Rivers

The DEIS, Draft Forest Plan, and Appendix E of the DEIS are inadequate by failing to assess the eligibility and to recommend Forest rivers for wild and scenic river status, and by failing to provide for interim protection of outstanding values for eligible rivers pending a suitability determination. For instance, the documents failed to comply with Chapter 8 of the Planning Handbook by limiting consideration to rivers identified by the Nationwide Rivers Inventory (NRI): the NRI is incomplete in the Pacific Northwest, and other rivers have identified potential in other studies (e.g. Pacific Northwest Rivers Study, State river assessments, and assessments by other public agencies). The documents even failed to consider a NRI listed river (the Breitenbush).

> **Response:** Early planning direction focused attention only on NRI-identified rivers. These only included certain segments of the McKenzie River and Breitenbush Rivers; and by the time the DEIS was written, the Breitenbush River was determined ineligible for further consideration by the USDI.
>
> In the interval between the DEIS and the FEIS, the Wild and Scenic River eligibility of segments of 13 rivers within the Forest's boundaries were evaluated. The river segments chosen for review

were identified through the public comment process. Among those reviewed were various segments of the Breitenbush River system.

Chapter III of the FEIS provides a complete list of the eligibility and classification status of rivers on the Forest. Management area standards and guidelines for Wild and Scenic Rivers in Chapter IV of the Final Forest Plan provide the appropriate level of protection to eligible river segments consistent with current planning direction, pending suitability determinations, or Congressional action. In addition, Appendix E of the FEIS provides narratives for each river segment describing its "outstandingly remarkable values." More detailed information is available in the process paper addressing Rivers in Forest Planning.

The DEIS and Draft Forest Plan fail to discuss how degradation of water quality will be prevented in designated and potential wild and scenic rivers (WSRs) and State Scenic Waterways (SSWs), as mandated by the Wild & Scenic Rivers Act. Similarly, the maintenance of water quality and management options for the recreational opportunities represented by free flowing rivers is not discussed.

Response: Direction about water quality in designated and potential WSRs and SSWs can be found in the management area standards and guidelines for Wild and Scenic Rivers (Chapter IV of the Final Forest Plan). Additional direction governing water quality which may also affect the special qualities of these rivers can be found in several places in Chapter IV of the Final Forest Plan, notably in the standards and guidelines for soil and water and in the standards and guidelines for dispersed recreation and riparian areas. Implementation and effectiveness monitoring will provide data to assure the desired results are occurring and to trigger appropriate corrective action if standards are not met. Information about management of recreation opportunities and water quality on designated and potential rivers can also be found in the FEIS in Chapters III, IV, and Appendix E.

The standards and guidelines (S&Gs) for interim protection of river segments eligible for inclusion as Wild and Scenic Rivers are inadequate and fail to provide the specific protections mandated through the USDA/USDI interagency guidelines and Forest Service Handbook direction in Chapter 8.

Response: The free-flowing conditions and outstandingly remarkable values of designated, study, and eligible Forest rivers are protected in a manner consistent with a variety of guidelines. These include the USDA/USDI Interagency Guidelines; the S&Gs for each river class noted in the Land and Resource Management Planning Handbook (FSH 1909.12, Chapter 8); and the management direction outlined in the Forest-wide and management area S&Gs in Chapter IV of the Final Forest Plan.

Interim management protects eligible rivers in several ways. It prevents modification of their free-flowing characteristics. It provides for protection, and to the extent practicable, enhancement of their outstandingly remarkable values. Finally, it limits activities to assure that corridors are not modified to the degree that eligibility or designation of the rivers at the highest classification for which they qualify would be adversely affected.

The proposal of the DEIS and Draft Forest Plan to downgrade management of the Little N. Santiam River, which is a designated State Scenic Waterway (SSW), is in conflict with State law.

Response: The Final Forest Plan considers the Little North Santiam River eligible for inclusion into the National Wild and Scenic River System. As such, appropriate interim management will apply. In addition, the Forest will coordinate with local, state, and other federal agencies to assure compliance with the Oregon Scenic Waterways Act. Appendix E of the FEIS lists the rivers receiving interim protection, and the management area standards and guidelines for Wild and Scenic Rivers in Chapter IV of the the Final Forest Plan sets Forest direction for eligible and designated Wild and Scenic Rivers.

The DEIS and Draft Forest Plan fail to address adequately the recreational aspects of Forest rivers, particularly the upper white water reaches used by river boaters.

Response: The FEIS and Final Forest Plan have been revised to more adequately deal with the recreation aspects of Forest rivers. Refer to the Forest-wide Standards and Guidelines and Management Areas 6a-c Chapter IV Forest Plan for specific management direction for Forest rivers, including the upper white water segments of rivers considered eligible for inclusion in the National Wild and Scenic Rivers System. See also Appendix E of the FEIS for narratives regarding the recreation aspects of eligible Forest rivers.

Wilderness

Adjacent Lands

The DEIS inappropriately addresses land uses adjacent to and near Wilderness by ignoring the Oregon Wilderness Act of 1984 by establishing de facto Wilderness and buffers to existing Wilderness.

Response: Land allocations for lands adjacent to Wildernesses vary by alternative. Chapter II of the FEIS describes and delineates the allocations which are made for each alternative. None of the Management Areas established under the Final Forest Plan are managed for the specific purposes of establishing buffers to existing Wildernesses or creating de facto Wilderness. They were established for other non-Wilderness uses. In addition, management for Wilderness does not maintain buffer strips of undeveloped wildland to provide informal extension of Wilderness, in compliance with the direction found at FSM 2320.3.

The DEIS inadequately addresses land uses adjacent to and near Wilderness by releasing potential Wilderness and backcountry values to irretrievable and irreversible harm through various management activities. Releasing such potential Wilderness is inappropriate when shortfalls in dispersed recreation opportunities are predicted and when those management activities intrude on the Wilderness values within exisiting Wilderness. In addition, the inadequate standards governing the management activities on lands near Wilderness will intrude on the values within existing Wilderness, particularly the small ones having larger relative perimeters.

Response: Chapter III of the FEIS identifies potential effects of management activities on Wilderness values. Chapter II of the FEIS considers a range of alternatives for the management of areas adjacent to and near Wilderness, and Chapter IV of the FEIS presents a discussion of the environmental consequences of these alternatives. While many different ways of treating these areas were considered, the Record of Decision chose the allocations under the Final Forest Plan.

Under the Final Forest Plan, when project activities are proposed near Wilderness areas, site specific project analyses consistent with the National Environmental Policy Act will occur. These

analyses will consider various alternatives and their effects on the environment, including nearby Wilderness values as appropriate. Appendix A of the Final Forest Plan discusses the management policy that the natural character of existing Wilderness shall not be changed to a lesser standard in order to disperse or accomodate increased use. The standards and guidelines in Chapter IV of the Final Forest Plan meet the requirements of 36 CFR 219.18(a) by managing visitor use in such a way that natural processes are allowed to operate freely and that values for which the Wildernesses were created are not impaired.

Commercial and Other Use

The documents inadequately address that Wilderness serves uses other than recreation (e.g. watershed protection, air quality, wildlife, and scenic values).

Response: Chapter III of the FEIS describes many of the values for which Wilderness is managed. Some of these include: recreational use; preservation of wildlife habitat; plant and animal diversity; unique geologic features; watersheds; and cultural resources. The goal of Wilderness management is to balance the needs for unmodified natural environments with recreational, scientific, biological, and educational uses. The management area standards and guidelines for Wilderness found in Chapter IV of the Final Forest Plan provide for the protection of Wilderness vegetation, fish and wildlife, air quality, and water and soil. Appendix A of the Final Forest Plan provides discussions of the resource values found in Wilderness.

The discussion on page A-14 of the Draft Forest Plan fails to include a reference to valid existing rights.

Response: Management area standards and guidelines in Chapter IV of the Final Forest Plan provide that where valid leases or locatable mineral interests exist, the rights of those claimants shall be met with the least possible impact on Wilderness resources.

The proposed standard for commercial use inadequately defines what will be considered "necessary use or services." Commercial permits should be submitted for public review through the EA or EIS process as appropriate.

Response: Appendix A of the Final Forest Plan provides that the primary considerations for accepting outfitter guide services in Wilderness include the affects of guided activities on the resource, levels of usage, and the need to provide services to visitors who would not otherwise experience Wilderness. The economic viability and delivery of high quality service by the enterprise should also be considered.

The standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan describe the factors which should be considered in expanding outfitter guide services, and in the disposition of existing permit rights when an existing outfitter wishes to sell those rights or discontinue all or part of the business. These factors will be considered in the context of appropriate NEPA analysis, whether categorical exclusion, environmental analysis, or environmental impact statement. The determination as to which level of NEPA analysis was used may be timely appealed.

Inasmuch as low-level overflights do have the potential to disrupt the solitude and naturalness of areas directly under their flight paths, we recommend you include consideration of low-level training missions in your discussion and decisionmaking process wherever solitude and naturalness are desirable attributes within the forest system.

Response: Many of the same features that give Wilderness special value to recreationists also provide a near ideal setting for military overflights and low altitude training routes: lands under federal jurisdiction which are relatively isolated, characterized by diverse topography, and maintain sparse human populations with minimal commercial activity. The Department of the Air Force is sensitive to such incompatibilities, and with continued involvement with the Forest Service generally directs such activities to areas with less sensitivity. Forest personnel are available to take complaints and coordinate with the military on a case by case basis.

Management

The documents fail to include historic bridges, roads, and trails within Wilderness in the list evaluated for historic significance.

Response: Specific reference to the structures and trails of particular concern within the boundaries of each Wilderness can be found in the individual Wilderness Management Plans in Appendix A of the Final Forest Plan. While inventory and evaluation is required, the evaluation of the historic significance of each of these improvements has not yet been completed. The management area standards and guidelines require that cultural resources be inventoried and historic significance determined, with the result that eligible historic sites and trails will either be maintained or adverse affects mitigated.

The source for the development of Wilderness policy should not be Regional Supplement 81.

Response: Wilderness policy for the Forest has been developed from several sources. Some of these include: the 1964 Wilderness Act; the Oregon Wilderness Act of 1984 (PL 98-328); the Forest Management Acts of 1897, 1899, and 1901; the Multiple -Use Sustained Yield Act of 1960; the National Forest Management Act of 1976; *Congressional Guidelines and Policies Regarding Grazing in National Forest Wilderness Areas*; and *Policies and Guidelines for Fish and Wildlife Management in Wilderness and Primitive Areas*. Supplement 81 provided interpretation of the various laws and directives and by its terms established interim policy only until Forest Plans could be developed. The Forest did consult Supplement 81 in developing the Final Forest Plan, but this consultation was neither exclusive nor controlling.

The interpretation of nondegradation is inadequate.

Response: "Nondegradation" seeks to assure that improvement will occur in those situations where Wilderness values have been impaired. The Limits of Acceptable Change System (LAC System) establishes acceptable levels of Wilderness use, while at the same time provides recognition that change is also a natural part of wild ecosystems. The LAC System, which is described more completely in Appendix A of the Final Forest Plan, establishes a process for inventorying existing conditions and comparing those conditions to appropriate standards. Nonconforming uses must have minimal effects on the ecosystem, as required by the Wilderness Act and other legislation.

The discussion at page IV-44 of the Draft Forest Plan states that fire restores natural ecosystems. This is in error. Rather, fires are more likely to convert one natural ecosystem to another or provide a different successional stage. Fires may even add to natural diversity. Prescribed burning as described in Chapter IV-149 of the DEIS is contrary to the intent of the Wilderness Act by allowing man's interference with natural processes.

Response: The language about fire "restoring" natural ecosystems has been dropped from the management area standards and guidelines for Wilderness in Chapter IV of the Final Forest

Plan. The discussion on the use of prescribed fire in the standards and guidelines for fire and fuels in Chapter IV of the Final Forest Plan acknowledges the natural role of fire in retaining a variety of plant communities and overall ecosystem processes. Additional discussion about fire in individual Wildernesses can be found in Appendix A of the Final Forest Plan.

Page IV-6 of the Draft Forest Plan states that heavily used trails, trailheads, and campsites will be returned to a more primitive condition. It is unclear whether this means maintenance will be neglected such that these features deteriorate and eventually disappear.

Response: Trails and designated campsites are not permitted in areas of Wilderness classified as Pristine. Heavily used facilities such as trails, trailheads, and campsites in the other three classes of Wilderness (Primitive, Semiprimitive, and Transition) will be rehabilitated, restored, or regulated in order to regain Wilderness characteristics compatible with those described in the Wilderness Act. Specific direction can be found in the management area standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan.

Recreational Use

The documents fail to indicate that higher levels of Wilderness use will result from the elimination of roadless areas and the failure to expand Wilderness under Alternative J and any of the other higher timber oriented alternatives.

Response: For purposes of this initial land management plan, the Oregon Wilderness Act of 1984 provided that lands reviewed in RARE II or in unit plans, as well as those roadless lands less than 5000 acres in size, had had adequate consideration for suitability for Wilderness.

Mt. Hagan was the only area on the Forest greater than 5000 acres which had not been previously considered for Wilderness designation in RARE II or in unit plans. 6292 acres in the Mt. Hagan area were recommended for Wilderness designation under Alternative C in the DEIS. In the FEIS, Alternative L recommends acreage in the Mt. Hagan area as Wilderness, a portion of which is coincident to a Research Natural Area (RNA). In all, Alternative L either recommends some 169,360 acres (including the Mt. Hagan portion) for Wilderness designation or Wilderness study.

The Final Forest Plan recommends no new Wilderness. The Final Forest Plan does recommend, however, that a portion of the acreage in the Mt. Hagan area be designated a RNA. In addition, the Final Forest Plan makes several areas available for semiprimitive non-Wilderness recreation opportunities, some of which are contiguous with existing Wilderness.

Use patterns resulting from the configuration of dispersed recreation opportunities in Alternative W will not be allowed to threaten the essential Wilderness character of specific areas. See generally the discussions in Chapters III and IV of the FEIS, Appendix A of the Final Forest Plan, and the standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan.

The DEIS fails to meet the need for Wilderness. Only in the Pristine category was use predicted not to exceed capacity by 2030, and then only by 2000 RVDs.

Response: Although Chapter III of the FEIS provides some revised estimates of projected use by Wilderness Resource Spectrum class, it remains true that demand is projected to outstrip the availability of many types of Wilderness experience on this Forest. Wilderness requires Congressional designation, and it is a finite resource.

The use of Wilderness is also governed by policy and regulation to protect its unique values, even in the face of high demand. For instance, Appendix A of the Final Forest Plan discusses the management policy that the natural character of existing Wilderness shall not be changed to a lesser standard in order to disperse or accomodate increased use. In addition, the standards and guidelines in Chapter IV of the Final Forest Plan meet the requirements of 36 CFR 219.18(a) by managing visitor use in such a way that natural processes are allowed to operate freely and that values for which the Wildernesses were created are not impaired. The result of these limitations is that, where appropriate, Wilderness use limitations may be imposed during the planning period.

The DEIS arbitrarily establishes user day limits by failing to document criteria and the relationships to actual environmental considerations.

Response: The management area standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan establish the group sizes, numbers of encounters, and dispersal standards for Wilderness use that will be used in the Final Forest Plan. The individual Wilderness Management Plans found in Appendix A of the Final Forest Plan also discuss the relationships between environmental considerations in specific Wildernesses and user limitations.

The process used in establishing user day limits involved carefully analyzing the Wilderness experience specific areas were capable of providing, inventorying the actual use patterns and existing resource conditions experienced in those areas, and determining the extent to which some or any limitations on use might prove beneficial. More information about this process is available in the Planning Records: the Wilderness Resource Spectrum Inventory Process and the Process for Estimation of Wilderness Capacity.

While the capacity concept and the use of "limits to acceptable change" to define capacity limits is appropriate, the proposed standard in transition and semiprimitive categories are not supported.

Response: Managing by Wilderness experience classes recognizes that portal areas and other popular areas which are easily accessible will produce more encounters than those described by the criteria. See generally the discussion of Wilderness Resource Spectrum classes in Chapter III of the FEIS, the management area standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan, and the Wilderness Management Plans in Appendix A of the Final Forest Plan.

The group size of 12 chosen for numbers of people/stock in the standards and guidelines found at 1.,1b(2) of the Draft Forest Plan fails to consider adequately that most extended trips greater than 4 days normally require 2 people and 3 horses, so the number chosen should have been 10 or 15. The discussion is also inadequate by failing to address whether administrative trips would be governed by the same numbers.

Response: Maximum group size provided by the management area standards and guidelines for Wilderness in Chapter IV of the Final Forest Plan is 24: 12 people and 12 head of stock. Larger groups of up to 12 people and 18 head of stock may be allowed by permit. Administrative trips are governed by the same maximum numbers.

Wildlife

Big Game

The DEIS fails to present the basis for the document's estimates of current deer and elk populations. Moreover, the estimates provided are high when compared to estimates of the Oregon Department of Fish and Wildlife (ODFW).

> **Response:** The FEIS has been updated to reflect ODFW's best estimates of current deer and elk populations.

The DEIS fails to provide a clear discussion of big-game modeling assumptions, procedures, coefficients, and the habitat variables used to derive population estimates. Readers cannot discern the relationships between animal numbers and habitat capability.

> **Response:** Chapter II of the FEIS expands the discussion of deer and elk modeling, while Chapter III discusses the habitat variables used to estimate habitat capability. A brief summary of the analysis process and the changes between the DEIS and FEIS is presented in Appendix B. A detailed explanation of the process used to revise the habitat capability and potential population analysis between the DEIS and FEIS is presented in a Process Paper which is a part of the formal Planning Record.
>
> There is no precise quantification of the link between big game populations and habitat effectiveness, because numerous factors in addition to habitat influence the actual number of animals in a particular area. For example, hunting regulations, hunting seasons, disease, parasites, poaching, yearly weather variation, and age class distribution of herds all influence populations. As a result, only a potential population index was used. Developed in cooperation with the Oregon Department of Fish and Wildlife, this index displays potential differences in populations resulting from habitat changes associated with management allocations and activities in each alternative. This index does not purport to display actual populations.

The Draft Forest Plan and DEIS do not adequately address the relationships of cover, forage quality, roads, and their relative positions on the landscape in providing habitat to support projected big game populations. The only model approved for use in assessing habitat effectiveness for elk in R-6 is "A Model to Evaluate Elk Habitat in Western Oregon" (Wisdom 1985). This model should be used as the minimum basis from which to estimate the effects of proposed management activities.

> **Response:** The FEIS and Final Forest Plan have incorporated the habitat effectiveness model (Wisdom 1985) into the analysis process to evaluate the effects of proposed management activities. The Final Forest Plan standards and guidelines further require the use of the model to evaluate effects and monitor trends at the project level.
>
> The variables used in the habitat effectiveness model address the relationships between the four primary habitat components of cover, forage quality, roads, and their relative positions on the landscape. Threshold values were assigned to each variable to ensure that habitat quality can support the deer and elk population objectives for specific areas. In addition, an overall habitat effectiveness objective was established for each of the three levels of management emphasis, "high," "moderate," and "low."

The documents inadequately assess the adverse impacts of current or future road densities on big-game habitat.

Response: Chapter III of the FEIS has been revised to include a discussion about the impacts of open roads on deer and elk habitat quality. Chapter IV of the FEIS includes the effects of roads as a component of the habitat capability assessment for deer and elk. Chapter IV of the Final Forest Plan includes Forestwide standards and guidelines (S&Gs) for habitat effectiveness, of which open road density is one of the four variables considered. The S&Gs also provide direction for access management in areas managed for deer and elk habitat.

The Draft Forest Plan/DEIS inadequately address potential deer and elk habitat improvement techniques, the timing of improvement techniques, and the locations for which such practices were prescribed.

Response: Each alternative in the FEIS provides some level of high or moderate deer and elk habitat emphasis, but the specific locations and relative proportions of the moderate and high habitat emphasis areas vary between alternatives. Chapter II of the FEIS describes the outputs and range of habitat emphasis in each alternative, and Chapter III includes a discussion of the habitat variables which must be addressed.

The standards and guidelines establish habitat quality objectives common to all alternatives for each level of habitat emphasis (high, moderate, low). Achievement of those habitat objectives (as measured by "A Model to Evaluate Elk Habitat in Western Oregon" (Wisdom 1985)) may require a number of habitat improvements such as road access management, forage enhancement, and maintenance of the forage to cover distribution. Since these are project and site specific decisions, the FEIS and Final Forest Plan merely provide estimates about the amount of habitat improvement work that will be required Forestwide. These estimates are provided in the Resource Action Schedule, Appendix D to the Final Forest Plan. Chapter V of the Final Forest Plan specifies the monitoring procedures which provide the information necessary to evaluate whether habitat objectives are being met and the overall effectiveness of the habitat program.

The documents fail to provide maps showing where deer and elk populations will be managed. In addition, the DEIS does not present site specific information on individual winter range condition, the location of winter range, or the definition that was used to describe winter range areas.

Response: The FEIS and Final Forest Plan include maps which were developed in consultation with the Oregon Department of Fish and Wildlife. These maps show the areas designated for high, moderate, or low emphasis habitat management for deer and elk, including delineation of winter range locations. Individual emphasis areas range in size from 3 to 10,000 acres, with some even larger areas where Wilderness comprises a significant component. Habitat quality may vary within each emphasis area, depending upon current conditions. As appropriate, however, the standards and guidelines provide direction for establishing upward trends in habitat quality with each planned activity in the area until the habitat objectives are met.

The discussion of deer and elk in Chapter III of the FEIS now includes the criteria used to determine winter range. The presence of optimal cover was used as the habitat variable forecasting the future condition of winter range. The effects of implementation of the various alternatives on deer and elk habitat and populations is discussed in Chapter IV of the FEIS.

The standards for winter range for deer and elk are worded very weakly in the Draft Forest Plan.

Response: The Forest-wide standards and guidelines have been revised to provide clear, measurable direction for deer and elk habitat effectiveness. The standards apply to entire management units (Emphasis Areas). The standards also recognize that summer range provides important habitat for healthy and productive populations.

The documents inadequately consider the role of old growth in providing quality winter range habitat, both for forage and thermal cover.

Response: The FEIS and Final Forest Plan acknowledge the biological importance of old-growth forests on deer and elk winter ranges. Chapter III of the FEIS describes the function of old growth in providing optimum cover quality and a forage resource. The amount of old growth present on winter range was used to estimate the long term habitat capability of the alternatives considered. This discussion can be found in Chapter IV of the FEIS and in Appendix B. The Final Forest Plan allocates 4100 acres of older forest specifically to winter range areas in order to meet the habitat and potential population objectives established for the preferred alternative.

Much of the scientific literature suggests that the health of deer and elk going into the winter period may be as important as winter range habitat quality, yet the DEIS fails to discuss the importance and effects of summer range quality.

Response: The FEIS and Final Forest Plan address habitat effectiveness within mapped "emphasis areas." This approach was used to recognize that all components of deer and elk home range contribute in an integrated manner to the health and productivity of these populations, including the quality of both summer and winter range. The effects of proposed management activities are assessed in Chapter IV of the FEIS and the assessment includes both summer and winter range evaluation. Project planning and monitoring provide the opportunity to test actual effectiveness of the areas.

While the importance of summer range is acknowledged in the FEIS, the ability of deer and elk to survive winter periods was considered the most limiting factor. Winter range constitutes a significantly smaller geographic area, and the amount and quality of forage is more limited during winter periods.

General

The documents failed to address comparison of issue and concern resolution for species other than elk and spotted owls.

Response: The FEIS, Chapter II, provides a comparison of issue and concern resolution as well as the estimated outputs for the alternatives considered. This comparison now includes Management Indicator Species (MISs), including primary cavity excavators, marten, pileated woodpeckers, spotted owls, deer, elk, bald eagle, and peregrine falcon. Comparisons of the environmental consequences of the management activities associated with the alternatives considered can be found in Chapter IV of the FEIS.

Many of the qualifiers used in the standards dealing with wildlife are subjective and there does not appear to be any measure against which to judge adherence to a standard. All standards should be measurable, or they serve little purpose.

Response: The standards and guidelines in the Final Forest Plan have been revised to include specific definitions for the descriptions governing the level of direction (Final Forest Plan, Chapter IV). For example, terms such as "shall," "should," and "may" are defined and contrasted. The standards and guidelines are also tied directly to specific monitoring questions designed to measure compliance with the standards. The monitoring plan (Final Forest Plan, Chapter V) describes the method of measuring the results the standards and guidelines must meet, the period for monitoring, the sample intensity, and funding needed to implement the monitoring plan.

Item 2, page IV-63 of the Draft Forest Plan fails to define "significant ground disturbance" under the standards and guidelines for threatened, endangered, and sensitive species.

Response: The standards and guidelines in Chapter IV of the Final Forest Plan have been revised to require biological evaluations for all activities that might affect proposed, endangered, threatened, or sensitive (PETS) plant and animal species. Examples of such activities would include projects such as timber harvest, road building, and habitat enhancement projects.

Habitat

The habitat capability projections for pine marten, pileated woodpecker, and spotted owls overestimate the capability to support these populations. Models used to predict capabilities are poorly documented, as are the rationales for establishing Minimum Management (MR) population levels.

Response: The model which was developed as a part of the viability analysis made in the spotted owl SEIS was used to determine this Forest's spotted owl habitat capability. A description of the analysis process can be found in that SEIS. A description of the revised process developed for estimating habitat capabilty for spotted owls, pileated woodpecker, and marten in the FEIS can be found in Appendix B and in a Process Paper included as part of the Planning Record.

Wildlife habitat is inadequately protected in the DEIS and Draft Forest Plan documents. Big game habitat is maintained only on "key ranges." Spotted owl habitat is at absolute minimal levels. Small mammal habitat is retained in only 10% of the managed forest. No mention of "wildlife tree" habitat is made. The guidelines for management adjacent to meadows would significantly affect the quality of this important wildlife habitat.

Response: A full range of alternatives is considered in the FEIS. Alternatives A, K, and No Change place relatively greater emphasis on activities such as timber harvest which alter or destroy habitat for many different species. Alternatives A and K meet Management Requirements (MRs) for maintaining viability of species, but management at these levels leaves little room for error or catastrophic events. Broadly speaking, Alternatives J, W, D, and L (in that order) provide increasing emphasis on nonconsumptive values such as visuals, plant and animal diversity and habitat, and old growth. Chapters II and IV of the FEIS provide detailed comparisons and evaluations of the environmental consequences of the alternatives.

The Final Forest Plan is based on the Preferred Alternative, Alternative W. This alternative has moderate levels of protection and enhancement for wildlife habitat. The Forestwide standards and guidelines (S&Gs) in Chapter IV provide deer and elk habitat emphasis throughout much of the Forest, direct that wildlife trees be left on all harvest units with specific habitat objectives for all subwatersheds, and require the retention of dead and down logs on all harvest units. Meadows are included in Management Area 9d in which they receive special protection wherever they occur, including "no harvest" buffers intended to protect the plant and animal habitat values of the area. Spotted owl habitat is provided at levels meeting the Amendment to the Regional

Guide, February 1989. In addition, Forestwide S&Gs provide some additional protection for verified spotted owl nest and pair roost sites when they occur outside the designated spotted owl habitat network.

The DEIS and Draft Forest Plan fail to address the issues of habitat fragmentation and catastrophic events on Management Indicator Species (MISs) requiring mature/old-growth habitat. A discussion of these effects and strategies for providing replacement habitat over time is needed.

Response: The FEIS includes an analysis of habitat fragmentation. The habitat capability estimates made for spotted owl, pileated woodpecker, and marten (Chapter II of the FEIS) include habitat fragmentation as a habitat variable. Appendix B of the FEIS includes a summary of the analysis process. A Process Paper included in the Planning record provides a more detailed description of the analysis process.

The Final Forest Plan provides for long term replacement of mature and old growth habitat in MA10a, MA 10d, MA11d, MA11e, and MA11f. Replacement needs due to catastrophic events have not been assessed. Assumptions included in the spotted owl FEIS and Amendment to the Regional Guide suggest that options for replacing habitat areas lost due to catastrophic event will remain beyond this planning period (10-15 years). In the event they do happen, such situations would be analyzed on a case by case basis, and as appropriate might lead to amendment or revision of the Final Forest Plan or Regional Guide. The uncertainty associated with viability of species for which MRs are set is addressed as part of the Final Forest Plan Monitoring Plan (Chapter V).

The documents inadequately defend their assumptions about the capacity of spotted owl, pine marten, and pileated woodpecker to disperse from "one isolated site to another."

Response: The ability of spotted owls, pine marten, and pileated woodpeckers to diperse and interact was a key assumption in the development of the Management Requirements (MRs) for these species. No published information exists on dispersal ability or dispersal habitat requirements for marten and pileated woodpeckers in the Cascade Range; and considerable effort continues to be focused on evaluating the dispersal capability of spotted owls. Consequently, the distribution requirements in the MRs were based on the best professional judgment of the biologists. Monitoring of habitat areas and individual species will provide the means of validating assumptions used in the development of the MRs.

The Final Forest Plan provides additional emphasis on the maintenance and development of corridors. This is reflected in the overall theme of Alternative W. Corridors are provided through protection of riparian corridors (MA15), and by the emphasis placed on longer rotations and retention of large trees within harvest units in Management Areas 10b,10d, 11d, 11e, and 11f.

The list of special wildlife habitats found on page IV-16 of the Draft Forest Plan fails to include several appropriate areas.

Response: The FEIS considered a wide range of allocations for special wildlife habitats. The Final Forest Plan is based on Alternative W, the Preferred Alternative identified in the FEIS. Alternative W provides protection for all inventoried special wildlife habitats. Chapter IV of the Final Forest Plan provides Management Area (MA9d), and the Forestwide standards and guidelines provide for protection of additional areas as they are identified.

The documents fail to provide adequate standards for the protection of "special wildlife habitats." For instance, the following "operational considerations" in the Draft Forest Plan should be made standards instead: a) roads are not generally acceptable within the boundaries of these areas (IV-113 and 115); b) minimize recreation developments within the areas (IV-113); c) overnight camping is generally not acceptable (IV-116). Another example includes allowing recreation sites and trails in and near such areas, subjecting those areas to unacceptable risk. Yet another example occurs in the DEIS at III-80. That passage describes the impacts of timber management activities near special and unique habitats and reasons to avoid these impacts. Despite that, the standards for the areas allow for up to 1/3 of the perimeter of meadows 30 acres or larger to be harvested. The standards also fail to provide adequate protection for the vegetation surrounding caves, cliffs, talus, and for meadows smaller than 30 acres.

Response: The various alternatives considered in the FEIS vary as to the amount of disturbance allowed adjacent to special and unique wildlife habitats. Alternative W, which is presented as the Final Forest Plan, acknowledges the contribution of special and unique habitats to overall plant and animal diversity within the Forest. Standards and guidelines (S&Gs) provide protection to the full perimeter of these special habitats as well as providing buffers wide enough to maintain the habitat features and value. Special and unique habitats and features are protected by allocations and S&Gs in MA 9d (Special Wildlife Habitats), MA 5a (Special Interest Areas), 10f (Lakeside Zones), and MA 15 (Riparian Habitats). The Forestwide S&Gs also direct the evaluation of additional, uninventoried special habitats during project level planning.

The Forest inappropriately increased the permissible distance between habitat areas without adequate baseline data regarding current populations of pine marten and pileated woodpecker. There is no assurance that viable populations of these species will be maintained.

Response: All alternatives, except No Change, meet the Management Requirements (MRs) established by the Regional Guide for pileated woodpeckers and pine marten. These MRs use habitat capability models, relying on an assessment of habitat quality, quantity, and distribution to evaluate potential populations of species.

It is true that Forestwide inventories of marten and pileated woodpeckers have not been conducted. A key factor in the Final Forest Plan is the Monitoring Plan (Chapter V). Requirements outlined there will be used to verify assumptions made in the FEIS, as well as to evaluate the effectiveness of the habitat networks established for the two species. If appropriate, monitoring results could lead to amendment or revision of the Final Forest Plan.

Management Indicator Species and Management Requirements

The documents provide an inadequate sensitivity analysis to justify increasing populations of selected wildlife.

Response: Chapters II and III of the FEIS discuss Management Indicator Species (MISs), including the method by which they are selected and the purposes for which they are used in analysis. The principal reason for Management Requirements (MRs) is to assure continued viability of the various species. A sensitivity analysis of the effects of the Management Requirements (MRs) on the populations of MISs is presented in Appendix G of the FEIS.

Habitat capability and habitat effectiveness for MISs are used to estimate the effects of the alternatives on potential populations of wildlife species. Chapters II and IV of the FEIS display projected changes in species populations. Through implementation of appropriate Recovery Plans, habitat management for bald eagles and peregrine falcons has been provided in the hopes

their numbers can increase. The only populations of MISs without "threatened or endangered" status that are projected to increase in the future are deer and elk. These animals are considered featured species, and as such they are not considered species for which there is a viability concern. Therefore manipulations of their populations may be undertaken to achieve objectives unrelated to MRs, such as providing adequate numbers for recreational hunting. The population increases for deer and elk therefore fall outside the purpose for which the MR sensitivity analysis was undertaken.

The DEIS inadequately documents declines for each Management Indicator Species (MISs) and inadequately justifies management strategies associated with the MISs against other NFMA regulated multiple use objectives.

Response: Chapter III of the FEIS provides an assessment of the current habitat capability and potential populations for the MISs. Chapter II compares the habitat capability provided by the various alternatives. Chapter IV then analyzes the effects associated with each of the considered alternatives. The Management Requirements (MRs) for the MISs provide a process for meeting National Forest Management Act requirements for species viability, and the range of alternatives provides several integrated approaches to achieving multiple use objectives.

Wildlife Management Requirements (MRs) lack variation between all alternatives considered (habitat acreage only nominally varies).

Response: MRs for wildlife habitat establish the lower limit for providing habitat necessary to maintain viable populations. These requirements are met in all alternatives, except No Change. MRs are exceeded in Alternatives D and L. The need to designate habitat areas for specific Management Indicator Species (MISs) depends on the risk of losing habitat quality, quantity, or distribution to the extent that habitat availability becomes a limiting factor for species viability. Chapters II and IV of the FEIS provide comparisons of habitat capability resulting from the allocations and management activities proposed in the alternatives.

All alternatives (except No Change) use Management Requirements (MRs) adopting use set aside or preservation strategies. Such strategies fail to consider: 1) the potential synergistic benefits to Management Indicator Species (MISs) of mixing successional stages in a mosaic of managed stands rather than small, isolated islands; and 2) the benefits to MISs of using modified silvicultural systems that prescribe scattered structural elements of mature/old-growth habitat within younger successional stages.

Response: During the development of MRs both preservation and management strategies were evaluated. The most administratively efficient method was preservation. The range of alternatives considered in the FEIS includes both preservation and management strategies; although all alternatives maintain a preservation strategy for the northern spotted owl. Chapter II of the FEIS describes the strategies used in each alternative.

The Final Forest Plan includes a strategy for managing a mosaic of successional stages while maintaining many of the vegetative attributes of older forests. This strategy includes MA10b, MA10d, MA11d, MA11e, and MA11f. These Management Areas (MAs) are managed to provide pine marten and pileated woodpecker habitat wherever they are coincident with MA9b and MA9c. The resulting landscape will provide a variety of benefits to wildlife not found in the exclusive "island" concept proposed in the DEIS. All pine marten and pileated woodpecker habitat areas rely on the concept of combining managed and reserved strategies to meet habitat requirements. The Final Forest Plan standards and guidelines for MA9b and 9c describe these

strategies. Appendix B of the FEIS summarizes how the management and reserved strategies were combined to assess long term habitat capability.

Marten

The discussion on principal habitats used by marten in the Appendix at H-8 says the Kuchler types used are from Guenther & Kucera (1978) and that some low elevation douglas-fir habitat on west slope of the Oregon Cascades is secondary habitat. Yet the Guenther & Kucera study indicates on p. 27 that low elevation douglar-fir habitat (Kuchler type "K2 Cedar-hemlock/douglas fir forest occurring mostly west of the crest of the Cascade range") is primary habitat for the pine marten, not secondary.

Response: The habitat network for marten has been revised to correct for this. Habitat distribution is provided throughout the Forest. The Monitoring Plan (Chapter V of the Final Forest Plan) provides direction for the evaluation and inventory of marten populations Forestwide.

160 acre habitat islands are inadequate to support a viable, well distributed population of pine martens, as pine marten home ranges are documented in the literature as being 704 to 2,048 acres for males and 576 to 1,088 for females.

Response: The Management Requirement for 160 acres of mature and old growth habitat for each marten habitat areas establishes the minimum habitat level to be considered in Forest Plans. No information is currently available on the home range size of marten found in the Oregon Cascades.

The FEIS provides habitat areas which are 500 acres in size. Of this acreage, at least 160 acres must be contiguous mature or old growth habitat. The remaining 340 acres must contain snags and downed logs, but it may consist of early seral forests having greater than 50% canopy closure. These 500 acre habitat areas are designed to serve as intermediate habitat for individuals moving between larger habitat areas found in Wilderness, roadless areas, spotted owl habitat areas, and pileated woodpecker habitat areas. Combined, these areas provide the habitat capabilities needed to maintain species viability. Chapter IV of the FEIS describes the effects each alternative will have on the Forest's capability to support marten populations.

Each pine marten habitat area is only large enough to support one marten. Removal of snags and down material from lands allocated for timber harvest will significantly impact marten populations by making habitat set-asides ineffective through isolation of individual animals. The scientific literature indicates that marten show an avoidance of openings, yet the DEIS and Draft Forest Plan provide no direction for connective travel corridors between habitat islands.

Response: The alternatives considered in the FEIS provide a range of habitat capability for marten. While the literature does indicate that marten will avoid openings, early seral forests provide suitable habitat for dispersal and hunting. Chapter IV of the FEIS describes the potential effects each alternative has on habitat capability for marten and providing dispersal corridors between habitat islands.

Final Forest Plan standards and guidelines provide revised direction for leaving additional snags and large down woody debris. The Final Forest Plan also acknowledges the importance of corridors. The result was the development of several Management Areas (MAs) which combined provide a network of travel corridors within each watershed. Examples include MA15 (Riparian), MA6 (Wild and Scenic Rivers), MA 10b and 10d (Dispersed Recreation), and MA11d, 11e, and 11f

(various Scenic condition classes). Refer to the MA descriptions, maps, and standard and guidelines for specific details.

The DEIS has apparent inconsistent direction for mapping and management of pine marten habitat areas. The documents are not clear about what distribution criteria were used or upon what research a 2 or 3 miles saving criteria was based.

Response: The Management Requirements (MRs) for marten specify that habitat capable of supporting marten must be distributed every 2000 to 5000 acres. This is equivalent to distributing habitat every 3 miles as measured edge to edge from the 160 mature or old growth habitat core area. Little published information was available to estimate dispersal distances of marten. The distribution distance as stated represented the best professional judgement of the wildlife biologists who made the MR recommendations.

The DEIS failed to discuss adequately coordination efforts with adjacent Forests in placing marten habitat areas.

Response: The marten habitat network varies by alternative depending on the need to provide specific land allocations to meet the Management Requirement for habitat quantity, quality, and distribution. The Mt. Hood and Umpqua National Forests were consulted to coordinate efforts in linking spotted owl, marten, and pileated woodpecker habitat networks. A Process Paper which is part of the Planning Record describes the processes used to evaluate, change, and assess the habitat needs for marten.

Primary Cavity Excavators

The Management Requirement (MR) level for minimum viable populations for pileated woodpecker need to be reanalyzed.

Response: The analysis of habitat requirements needed to meet MRs for pileated woodpeckers has been revised in the FEIS. The analysis method is summarized in Appendix B of the FEIS. The MR habitat network in the FEIS is based on meeting distribution requirements for the appropriate amounts and quality of habitat. No specific population requirement was calculated, although habitat capability was used to estimate potential populations (Chapters II and III of the FEIS) and to evaluate effects of the alternatives considered (Chapter IV of the FEIS).

The DEIS presented no inventory of snag habitat or the primary cavity excavator (PCEs) species for which Management Requirements (MRs) were set. This throws in question how current and future conditions were projected.

Response: Chapter III of the FEIS provides a discussion of the PCEs represented as well as the current habitat capability of the Forest. While no population inventories have been conducted for the PCEs, the MR strategies were set to assure continued viability of the species. Forest monitoring will provide information to validate assumptions and the effectiveness of strategies. The snag habitat inventory was determined from a combination of data sources including the timber inventory and ecology inventory plot data. A summary of the analysis process can be found in Appendix B of the FEIS. A more detailed Process Paper describing analysis changes and assessment processes can be found in the Planning Record.

There is no biological basis for the proposition that managing for 20% potential populations of primary cavity excavators (PCEs) will support viable populations of all wildlife species dependent on snag habitat.

Response: No quantitative research has been completed to date establishing the minimum habitat levels for maintaining the viability of all species dependent on snags. The Final Forest Plan establishes a management objective of 40% potential population levels within each subwatershed, and standards and guidelines address distribution patterns. The approach used meets the Regional Guide requirements.

The Draft Forest Plan (IV-14) proposed providing only .4 hard snags per acre in all conifer types by successional stages for primary excavator species. Soft snags are not mentioned at all. Based on information in Brown, 1985, it would seem that providing only .4 snags per acre will fail to maintain 20% of the potential population levels of primary excavators.

Response: The analysis for wildlife tree habitat has been revised to reflect information in Brown (1985) and other recently published literature relevant to snag habitat use in Western Oregon (Schreiber 1987; Nelson 1988). The standards and guidelines (S&Gs) for the Final Forest Plan reflect these revisions by requiring an overall retention rate to maintain habitat capability in each subwatershed for 40% potential populations. This amounts to an average of 1.8 snags per acre. Contributions to this subwatershed average by the harvest units must be at an average rate not less than 20% of potential populations (.9 snags per acre). These revisions are described more fully in Chapter III of the FEIS and Appendix B. A Process Paper which is a part of the Planning Record provides a detailed description of the changes made between the DEIS and FEIS.

The S&Gs also provide that Class IV and V snags ("soft snags") should be retained wherever possible.

The DEIS documents fail to comply with Regional guidelines for dead and defective tree habitat by maintaining only 20% of the primary cavity excavator (PCE) biological potential. The Regional Guide requires maintaining in excess of 40% PCE biological potential. The DEIS documents also use a combination of commercial and noncommercial forest land to meet this requirement. This is in error, as the proper interpretation of the Regional Guide is to maintain 40% of the potential population capacity on both commercial and noncommercial lands instead of by an averaged combination.

Response: The 40% potential population levels are maintained at the subwatershed level. The standards and guidelines (S&Gs) for dead and defective trees have been modified to calculate snag levels at the subwatershed level. To ensure appropriate distribution of snag habitat throughout a subwatershed, an additional S&G was developed requiring that the habitat needs of the primary cavity excavator with the most limiting territory size be met within each harvest unit. Final Forest Plan S&Gs (Chapter IV) therefore specify a 5 acre distribution pattern wherever snags are left in a clumped pattern instead of being evenly distributed throughout the subwatershed. In addition, S&Gs also provide for retention of habitat levels throughout the timber rotation, as well as for increasing snag retention in planned timber harvest units to mitigate the lack of snag habitat in previously harvested units. The present forest landscape is a mosaic of commercial and noncommercial lands, and PCEs utilize habitat according to its availability and suitability. Accordingly, combining land allocations in assessing habitat availability provides a closer representation of biological potential. The approach used in the FEIS and Final Forest Plan meets the intent of the Regional Guide.

The effects discussion in the DEIS fails to address the role of snag dependent birds in Forest pest management and how the biological control of pests may be significantly reduced by providing habitat levels below 60% potential population needs for primary cavity excavators (PCEs).

Response: This discussion has been included in Chapters III and IV of the FEIS. The section in Chapter IV detailing information needs acknowledges the lack of information available on the ecological role of differing potential population levels of insectivorous birds. Chapter V of the Final Forest Plan includes several monitoring questions developed to address the need for research on cavity nesting species on the Forest.

Spotted Owl

Considering that the spotted owl is listed as threatened by the State of Oregon, the documents inappropriately permit destruction of 40% of the remaining habitat.

Response: Except for the No Change Alternative, all alternatives considered in the FEIS meet or exceed the Management Requirements established by the Amendment to the Regional Guide, Feb. 1989. Chapter IV of the FEIS provides an analysis of the environmental consequences to spotted owl habitat resulting from each of the alternatives considered in detail. A spotted owl habitat area (SOHA) network has been established for the Forest. SOHAs constitute Management Area 9a (MA9a) in the Final Forest Plan. In addition, the forestwide standards and guidelines provide protection for spotted owl pairs having verified nest or roost sites located outside MA 9a.

The DEIS documents inappropriately equate Wilderness acreage with wildlife habitat. Wilderness is less productive as wildlife habitat. Putting several SOHAs into Wilderness goes against the very idea of having SOHAs provide long-term owl population stability in the first place.

Response: Wilderness areas provide substantial amounts of suitable habitat for many species of wildlife, serving as reservoirs for biological diversity. Chapter II of the FEIS displays the habitat capability provided in Wilderness areas for mature and old growth forest indicator species including the spotted owl. While clearly not all Wilderness provides suitable habitat for the spotted owl, some portions of Wilderness areas on the Forest are highly suitable for the birds. To date, fifteen pair of spotted owls have been verified within Wilderness. A table in Chapter IV of the FEIS displays the number of verified pairs located in Wilderness, SOHAs, and in other land allocations.

The Regional Guide was amended since publication of the DEIS. The Regional Guide requires the designation of SOHAs distributed across all forest lands, except those "withdrawn by Chief's authority or higher." As Wilderness was withdrawn under Congressional authority, the result is that designated SOHAs do not occur within Wilderness boundaries in the FEIS.

Alternative J fails to protect wildlife adequately by breaking a vital link in the chain of wildlife. The spotted owl will die. As a result, many other species will also die.

Response: Management for spotted owls has been changed in the FEIS to conform with the spotted owl Supplemental FEIS and Amendment to the Regional Guide. Management Requirements (MRs) are set to maintain viability of spotted owls across their range. The spotted owl habitat network, in conjunction with other forest lands removed from timber harvest, establishes a reserved base for the protection of the species which is supplemented by other habitat within the commercial land base. The ecological role of the spotted owl was one reason for its selection as a Management Indicator Species (MIS) for mature and old growth forest habitats.

Much of the controversy surrounding the viability and habitat requirements of the northern spotted owl has yet to be resolved. The US Fish and Wildlife Service is considering listing the

spotted owl as a federally listed Threatened and Endangered Species. Based upon monitoring information and recovery plans if the species is listed, Forests will amend or revise management direction, as needed. The Monitoring Plan can be found in Chapter V of the Final Forest Plan.

The Draft Preferred Alternative manages at the Management Requirement (MR) level for spotted owl without provision for loss due to catastrophic events; an increase of at least 20% above MR should be provided to reduce risk to this sensitive species.

Response: The Final Forest Plan provides for spotted owl habitat at the level required by the spotted owl FSEIS and Amendment to the Regional Guide. Analysis conducted as part of the FSEIS indicated that options would be available to revise habitat networks (including size and distribution) at the end of the five year decision period. Some of these options were used on this Forest following the Shady Beach Fire which catastrophically damaged a proposed network SOHA. The habitat network was adjusted, and the damaged areas were replaced with ones of equal value. Uncertainty exists about how often this approach could be used. Consequently, Chapter V of the Final Forest Plan provides an intensive monitoring plan for owls and their habitats. In addition, the FEIS considers two Alternatives, D and L, which provide habitat significantly above the MR level.

There are serious questions about the validity of the Forest Service viability model. Substantive questions of the various computer models in the determination of population viability of owls (and perhaps other species) have been raised. See Boyce, M.S., A Review of the U.S. Forest Service's Viability Analysis for the Spotted Owl, U. of Wyoming, Laramie, 12/2/87, 50pp..

Response: The viability analysis for the spotted owl can be found in documents prepared as a part of the Final Supplemental EIS for Spotted Owl (SEIS) and accompanying Record of Decision, released February, 1989. This viability analysis covers the bird's entire range in Region 6. Direction issued as an amendment to the Regional Guide requires that Forest level planning undertake certain further analysis to verify the potential population estimates made in the SEIS for each affected Forest. Chapter IV of the FEIS makes this assessment. The process used for estimating habitat capability involved analysis based on a more current vegetation inventory designed to measure the vegetation attributes of mature and overmature forests. This process is described in Appendix B; and it is described in further detail in a Process Paper which is a part of the Planning Record. The results of the analyses by the affected Forests will provide valuable monitoring information for the SEIS, including data bearing on issues of modeling validity. If warranted, the data could trigger future amendments or revisions to the SEIS and Regional Guide direction.

Spotted owl habitat areas (SOHAs) have increased from 78 to 91 pairs. This addition of 13 SOHAs constitutes an illegal standard under the Administrative Procedures Act. This decision greatly exceeds all legal standards set by Congress for wildlife management; and the public has not been given the opportunity to comment on the additional 28,600 acres set aside for the 13 extra pairs. The spotted owl Minimum Requirement (MR) of 91 pairs was built into every alternative, so the alternatives do not represent a true variation in methods of spotted owl management.

Response: Management of spotted owls changed between the DEIS and FEIS as a result of the spotted owl SEIS and subsequent Amendment to the Regional Guide. The SOHA network displayed in the FEIS complies with the Regional Guide. Spotted owl habitat areas (SOHAs) have not been designated within Wilderness boundaries, but the suitable habitat within Wilderness and other lands unsuited for timber production provided the baseline from which the SOHA

network was established. SOHAs were designated wherever distribution, quality, or quantity of suitable spotted owl habitat was limited.

The documents fail to cite the Interagency Agreement signed 12/1/87 between the U.S. Fish and Wildlife Service and Forest Service concerning the coordinated efforts of the two agencies to assure the well-distributed continued existence of the northern spotted owl throughout its National Forest range.

Response: The Interagency Agreement was superceded by the Record of Decision for the spotted owl SEIS. Subsequently, the Regional Guide was amended to update the Management Requirements (MRs) for the northern spotted owl. Although this specific Interagency Agreement may have been superceded, the Forest Service has continued to coordinate with the BLM, State agencies, and National Park Service. This coordination has resulted in a spotted owl habitat network on this Forest that meets distribution requirements within and between National Forests and provides linkage with spotted owl habitat areas on adjacent BLM ownership.

The documents fail to analyze adequately the spatial distribution of spotted owls within the Forest and for connection with the lands under the jurisdiction of other federal agencies.

Response: The spotted owl habitat network has been revised between the DEIS and the FEIS. In order to comply with the Regional Guide, as amended, coordination with other National Forests and the Bureau of Land Management was required. The spotted owl habitat areas (SOHAs) in the FEIS meet the distribution requirements of the Regional Guide and provide linkage with habitat areas on the lands of other National Forests and the BLM. A more detailed description of the process used to develop the current habitat network can be found in a Process Paper located in the Planning Records.

Threatened, Endangered, and Sensitive Species

Figure III-J-1 of the DEIS at page III-70 inadequately discusses wolverines by stating that the majority of wolverine sightings occur "in Wilderness where abundant habitat exists." Relatively little is known about wolverine ecology in the U.S. In fact, evidence indicates that wolverines may make extensive winter use of Forest types other than those traditionally considered as wolverine habitat, i.e. high elevation habitat types found in most of Oregon's Wilderness. See Hornocker, U. of Idaho.

Response: Abundant habitat for wolverine does exist within the Wilderness areas of the Forest. The Forest recognizes the need to evaluate wolverine sighting data further, conduct inventories, and prepare species management plans where appropriate. The standards and guidelines in Chapter IV of the Final Forest Plan address the need to ensure adequate consideration of this sensitive species.

The DEIS fails to provide adequate consideration for bald eagles. For instance, there is inadequate treatment of winter roost sites. The 1152 acres of habitat for existing nest sites fails to provide allocations for recovery areas of adequate size and distribution to meet the Regional Forester's commitment to participate in the Pacific States Bald Eagle Recovery Plan. There is inadequate management of both occupied habitat and recovery areas within Bald Eagle Management Areas (BEMAs) by allowing the administrative use of roads built prior to nest establishment, salvage operations in BEMAs, and recreation trails.

Response: All alternatives in the FEIS comply with the Management Requirements (MRs) established for the recovery of the bald eagle. Alternatives W, D, and L increase the consideration for bald eagle habitat needs (Chapter II of the FEIS). The standards and guidelines for Management

Area 8 (MA8, Bald Eagles) in Chapter IV of the Final Forest Plan provide direction for site specific development of Bald Eagle Management Plans for all active nest sites. These Plans include habitat requirements for alternate or future replacement nests, roost sites, and forage areas. MA15 provides direction for the protection of riparian resource values associated with wetlands, lakes, and rivers. These riparian areas often provide roost areas. In addition, the standards and guidelines have been revised to increase protection of potential nest and roost sites.

The sum of the direction meets the objectives of the Pacific States Bald Eagle Recovery Plan and places appropriate restrictions on activities that might negatively affect bald eagles.

Figure IV-D-4 of the Draft Forest Plan failed to list the peregrine falcon.

Response: This has been corrected.

The standards and guidelines inadequately develop management plans for threatened and endangered species which address nesting, foraging, and roosting sites.

Response: The standards and guidelines in Chapter IV of the Final Forest Plan have been revised. They provide direction for the preparation of site specific management plans for threatened and endangered species.

Other Topics

Cultural Resources

The DEIS and Draft Forest Plan inadequately and inconsistently discuss cultural resource management. Some examples include: direct discussion in some, but not all, Wilderness areas; inconsistent standards and guidelines between management areas; only indirect treatment in SIAs; and no discussion for general management areas. Major features of the cultural resources program are omitted. The documents fail to comply with the spirit of the NHPA by failing to integrate a real concern and long term commitment to cultural resources management.

Response: The Standards and Guidelines were drafted to meet NHPA requirements and accompanying federal historic preservation legislation, consistent with the needs of the specific management areas. The monitoring plan provides the mechanism through which implementation, effectiveness, and validation of the Standards and Guidelines can be judged. If appropriate, the Forest Plan can be amended or revised to meet changing needs.

Stated direction for historic structures in the DEIS fails to comply with 36 CFR 800.3(b)(4).

Response: The standards and guidelines and management area prescriptions comply with 36 CFR 800.3(b)(4) in the FEIS.

The documents fail to treat lookouts and guard stations, in and out of Wilderness, as historic structures.

Response: Chapter III of the FEIS, Artifacts and Sites, identifies lookouts and guard stations as cultural resources which merit the same historic preservation treatment as other similar historic structures. As such, the standards and guidelines apply to lookouts and guard stations.

Firewood

Page IV-44 of the DEIS states that as much as 73,000 cords would be taken under one of the alternatives, but it does not discuss the serious environmental consequences of the fuelwood program or consistency with State/Federal policies. Specifically, the DEIS should clearly demonstrate that woodcutting fees are not subsidizing public's use of fuelwood.

> **Response:** Chapters III and IV of the FEIS discuss the environmental effects of the firewood program, and the growing concerns about the effect of woodsmoke on air quality and health. There is also a discussion of the local, State and national policies on firewood and woodsmoke. An analysis of the role of fees in the firewood program is beyond the scope of the FEIS.

Insect and Disease

The DEIS inadequately explores foreseeable adverse effects from pests, disease, and physical damage to leave trees specifically associated with commercial thinnings.

> **Response:** Commercial thinning is a common silvicultural practice that has been used successfully on this Forest for many years. Actual proposals to commercially thin an area will be analyzed based on site specific information which can better address the potential adverse effects within the proposed area than this programmatic EIS. Based upon that analysis, an appropriate NEPA decision document will be prepared. If monitoring shows that adverse effects are significantly greater than anticipated by the Final Forest Plan, then appropriate corrective action will be taken, including possible amendment or revision of the document.

The standards and guidelines in the DEIS fail to exclude insect and disease control from Wilderness areas.

> **Response:** The standards and guidelines for integrated pest management in Chapter IV of the Final Forest Plan clarify the use of control measures in Wilderness. Control measures for naturally occurring levels of insects and disease will normally be excluded in Wilderness, except where site specific project analysis shows there is an unacceptable threat to resource values outside the boundary.

LIST OF WHO COMMENTED

Federal Agencies

US Dept. of Ag., Forest Service, N.W. Range and Exp.
US Dept. of the Air Force, Western Regional Engineer
US Dept. of Energy, Bonneville Power Administration
US Dept. of Interior, Environ. Proj. Review
US Dept. of Interior, Fish and Wildlife, Portland
US Dept. of Trans., Highway Admin., Region 10
US Environmental Protection Agency, Region 10
Northwest Power Planning Council

State Agencies and Elected Officials

Oregon House of Representatives, Larry Campbell
Oregon House of Representatives, Cedric Hayden
Oregon House of Representatives, Liz VanLeeuwen
Oregon Senate, Cub Houck
Oregon Senate, Bob Kintigh
Oregon Senate, Mae Yih
State of Oregon, Governor Neil Goldschmidt
Oregon Dept. of Agriculture
Oregon Dept. of Energy
Oregon Dept. of Land Conservation and Development
Oregon Dept. of Environmental Quality
Oregon Dept. of Fish and Wildlife
Oregon Dept. of Geology and Mineral Industries
Oregon Dept. of Human Resources, Employment Division
Oregon Dept. of Transportation, Parks and Recreation
Oregon Dept. of Transportation, Highway Division
Oregon Division of State Lands
Oregon Economic Development Department
Oregon Executive Department, Office of Economic Analysis
Oregon State Dept. of Forestry
Oregon Water Resources Department

Local Governments and Elected Officials

Lane Council of Governments
Benton County Board of Commissioners
Douglas County Board of Commissioners
Lane County Board of Commissioners
Lane County Commissioner, Jerry Rust
Linn County Board of Commissioners
Linn County Sheriff, Art Martinak
Marion County Board of Commissioners
City of Albany
City of Cottage Grove
City of Creswell
City of Detroit
City of Eugene
City of Florence
City of Gates
Mayor, City of Idanha, Albert Adams
City of Lebanon
City of Lowell
City of Mill City
City of Oakridge
City of Salem
Mayor, City of Springfield
City of Stayton
City of Sublimity
City of Sweet Home

Native American Tribes

None

Utility and School Boards

AUMSVILLE ELEMENTARY SCHOOL, District 11c
CASCADE SCHOOL DISTRICT UH NO 5
EMERALD PEOPLE'S UTILITY DISTRICT
LINN-BENTON COMMUNITY COLLEGE
MARI-LINN SCHOOL, District 29-J
MARION EDUCATION SERVICE DISTRICT
STAYTON UNION HIGH SCHOOL

Businesses

ACTION MANUFACTURING
AGNEW LUMBER CO
ALTA TIMBER CORP
AMERICAN PLYWOOD ASSOCIATION
AUTOMATIC TRANSMISSION SPECIALTIES
BEISSER'S INC
BERJAC OF OREGON
BLACHLY-LANE ELECTRIC CO-OP
BOHANNON'S NURSERY
BOHEMIA INC
BRATTAIN INTERNATIONAL TRUCKS
BREITENBUSH HOT SPRINGS RETREAT
BURNS REFORESTATION & MGT
BURT'S FURNITURE

C F LAUGHLIN LOGGING CO
C J HANSEN CO
CALVERT CO INC
CANYON DRIVE LUMBER COMPANY
CARROLL, HATCH & ASSOCIATES
CB CEDAR COMPANY
CEDAR WEST
CHAPMAN BROS
COLONIAL LUMBER CO INC
COLUMBIA HELICOPTERS
COTTAGE GROVE HOSPITAL
CURTIS RESTAURANT EQUIPMENT
D STAKE MILL INC
DANLO MANUFACTURING CO
DENVER REEL AND PALLET COMPANY
DURAMETAL CORP
ECONOMY SUPPLY BUILDING CENTER
EDMAN FINE FURNITURE
EDMUND A ALLEN LUMBER COMPANY
EOFF ELECTRIC COMPANY
EUGENE CARBIDE SAW SERVICE INC
EUGENE EMERALDS
EUGENE METAL FINISHERS INC
EVERGREEN RESOURCE CO
FALLS CREEK HYDROELECTRIC PROJECT
FERRELLGAS INC
FLIGHTCRAFT
FLYING SCOTSMAN INC.
FOREST PRODUCTS SALES
FRERES LUMBER CO.
FURMAN LUMBER INC
GANG-NAIL COMPONENTS INC
GEM LOGGING INC
GIUSTINA BROS
GLEAVES,SWEARINGEN,LARSEN,& POTTER
GORDAN ZOLEZZI INSURANCE AGENCY INC
HAMBRO FOREST PRODUCTS INC
HAMILTON ELECTRIC INC
HAMMER LUMBER CO
HARRIS GROUP INC
HOYT, GAYDOS & CHURNSIDE, P.C.
HUNT PLYWOOD COMPANY INC
INTERNATIONAL PAPER COMPANY
J C BALDRIDGE LUMBER CO
J R GROBMYER LUMBER CO
JB COMPANY
JC JONES OIL CO
JELD-WEN
JIM'S OREGON WHITEWATER
JOHN W. HITCHCOCK, ATTORNEY AT LAW
KENDALL FORD
KVAL TELEVISION
L E BLAN CO
LAMON LUMBER COMPANY
LANE PLYWOOD INC.
LINCOLN BENEFIT LIFE
LONGVIEW FIBRE COMPANY
LUMBER PRODUCTS
LUMBER TECH INC
M & M SUPPLY
MARLEY COOLING TOWER COMPANY
MARX, KNOLL, DENIGHT & DODGE
MC GUIRE BEARING COMPANY
MCGINNIS LUMBER CO INC
MCKAY INVESTMENT COMPANY
MID-STATE PETROLEUM
MILL SUPPLY CORP
MODOC LUMBER CO
MONETT LOGGING INC
MONROE/PALBURN INC
MONTMORE TIMBER PRODUCTS INC
MORROW, MONKS & SHARP, PC
MOSER LUMBER INC
MOSS ADAMS-CPA'S
MW MANUFACTURERS, INC
NAPA DISTRIBUTION CENTER
NICHOLS LUMBER & HARDWARE CO
NORTH PACIFIC LUMBER CO
NORTHWEST GREENTREE INC
NORTHWEST NATURAL GAS CO
NORTHWEST STAMPING INC
ORDELL CONSTRUCTION COMPANY
OREGON EMERY COMPANY
OREGON LLAMAS
OUTDOOR ADVENTURES PLUS
PACIFIC LUMBER AND SHIPPING CO
PACIFIC POWER & LIGHT CO
PAPE BROS INC
PBMC INC
PCS CLEANING SERVICE
PENDLETON MILLING CO
PENDLETON WOOLEN MILLS
POOLE-LARSEN FUNERAL HOME
POPE & TALBOT
PRINEVILLE SAWMILL CO INC
QUALITY VENEER INC
RAPID TRANSFER & STORAGE
REFORESTATION SERVICES
RAM STEEL INC
ROBERTS & DYBDAHL INC
ROGERS MACHINERY COMPANY INC
ROGUE PACIFIC LUMBER CO
ROSBORO LUMBER COMPANY
ROY KEENE COMPANY
SALEM EQUIPMENT INC
SCHAUDT, STEMM & WILD INC
SEATTLE-TAC0MA BOX CO
SECOND GROWTH FOREST MANAGEMENT INC
SERRA LUMBER CO
SESSLER INC.
SHINY ROCK MINING CORP
SNAVELY FOREST PRODUCTS CORP
SNAVELY-WARWICK INC
SOUTHERN PACIFIC TRANSPORTATION CO
STANDARD INSURANCE CO
STRINGFELLOW LUMBER CO
ROSEBURG FOREST PRODUCTS
STU JONES LUMBER
SUISLAW VALLEY BANK
SWANSON BROS LUMBER CO
TAYLOR STRUCTURES
TBG ARCHITECTS & PLANNERS
TETON WEST LUMBER INC
TEXAS BUILDERS
THE FRANK A CONKLING COMPANY
TIDEWATER DRY KILNS

TREES UNLIMITED INC
TUMAC LUMBER CO INC
TYGH VALLEY MOULDING
U S FOREST PRODUCTS INC
UNOCAL CORPORATION
VALLEY CONTRACTORS SUPPLY INC
VOS PLUMBING INC
WEST SALEM MACHINERY CO
WESTERN COATING INC
WESTERN INDUSTRIAL LUMBER INC
WESTERN STATES FOREST PRODUCTS
WESTSIDE KASH-N-KARRY
WEYERHAEUSER
WILLAMETTE INDUSTRIES
WILLAMETTE LOGGING COMMUNICATIONS
WILLAMETTE PASS SKI CORP
WOOD PRODUCTS MFG CO
WOOD-LAM STRUCTURES INC
WOODGRAIN MOULDINGS INC
WOODWORK INC
ZANKL SALES
ZIP O LOG MILLS INC

Other Organizations

ALBANY AREA CHAMBER OF COMMERCE
AMERICAN FISHERIES SOCIETY-OREGON CHAPTER
AMERICAN RIVERS
ASSOCIATION OF O & C COUNTIES
ASSOCIATION OF OREGON ARCHEOLOGISTS
AUDOBON SOCIETY OF LANE COUNTY
AUDOBON SOCIETY-CENTRAL OREGON CHAPTER
AUDUBON SOCIETY OF CORVALLIS
AUDUBON SOCIETY OF OAKRIDGE
BROWNSVILLE PIONEER SADDLE CLUB
CENTER FOR HOLISTIC RESOURCE MGT
CHEMEKETANS
CITIZEN'S TASK FORCE-TIMBER SALE
COTTAGE GROVE CHAMBER OF COMMERCE
CRESWELL CHAMBER OF COMMERCE
DOUGLAS TIMBER OPERATORS INC.
EUGENE CHAMBER OF COMMERCE
EUGENE/SPRINGFIELD METRO PARTNERSHIP INC
FEDERATION OF WESTERN OUTDOOR CLUBS
FLORENCE CHAMBER OF COMMERCE
FRIENDS OF BREITENBUSH CASCADES
FRIENDS OF CATHEDRAL FOREST
GREEN PARTY FEDERAL EXECUTIVE COMMITTEE
HARDESTY-JUNE WILDERNESS COUNCIL
HARRISBURG CHAMBER OF COMMERCE
ISAAK WALTON LEAGUE OF AMERICA INC
LEAGUE OF WOMEN VOTERS OF LANE CO.
LEAGUE OF WOMEN VOTERS OF LANE COUNTY
LEAGUE OF WOMEN VOTERS-SALEM
LEBANON CHAMBER OF COMMERCE
MAZAMAS
MCKENZIE FLYFISHERS
MCKENZIE GUARDIANS
MCKENZIE RIVER CHAMBER OF COMMERCE
MID WILLAMETTE VALLEY TRAIL RIDERS
MID-WILLAMETTE FLY FISHERS
MIDDLE SANTIAM WILDERNESS COMMITTEE
MOUNTAIN STATES LEGAL FOUNDATION
MT JEFFERSON SNOWMOBILE CLUB
NATIVE AMERICAN STUDENTS
NATIVE PLANT SOCIETY OF OREGON
NATIVE PLANT SOCIETY, CORVALLIS CHAPTER
NATIVE PLANT SOCIETY-EMERALD CHAPTER
NATIVE PLANT SOCIETY-WASHINGTON
NATIVE PLANT SOCIETY-WILLAMETTE VALLEY
NATURAL RESOURCES DEFENSE COUNCIL
NORTH SANTIAM CHAMBER OF COMMERCE
NORTH WEST TIMBER ASSOCIATION
NORTHWEST FORESTRY ASSOCIATION
NORTHWESTERN LUMBERMANS ASSOCIATION
OBSIDIANS, INC
OREGON BANKERS ASSOCIATION
OREGON ENVIRONMENTAL COUNCIL
OREGON FUR TAKERS OF AMERICA
OREGON GUIDES & PACKERS
OREGON GUIDES AND PACKERS ASSOCIATION
OREGON HUNTER'S ASSOCIATION
OREGON HUNTERS ASSOC-EMERALD VALLEY
OREGON MR. LONGEARS CLUB
OREGON NATURAL HERITAGE DATA BASE
OREGON TROUT
OREGON WOMEN FOR TIMBER
OREGONIANS FOR PROTECTION OF ECOLOGICAL QUALITY
PACIFIC NORTHWEST 4WD ASSOCIATION
PORTLAND CHAMBER OF COMMERCE
LANE COUNTY CHAMBER OF COMMERCE
R.O.A.D.S.
SALEM AREA CHAMBER OF COMMERCE
SANTIAM FISH & GAME ASSOCIATION
SIERRA CLUB - OREGON CHAPTER
SIERRA CLUB-BLUE MOUNTAIN GROUP
SISTERS FOREST PLANNING COMMITTEE
SOCIETY OF AMERICAN FORESTERS-CAPITAL CHAPTER
SOUTH CENTRAL ASSOCIATION OF NEIGHBORS
SPRINGFIELD CHAMBER OF COMMERCE
STAYTON AREA CHAMBER OF COMMERCE
SUMMIT GRANGE #432
SUPERINTENDANT, ALBANY PUBLIC SCHOOL DIST.
SWEET HOME CHAMBER OF COMMERCE
THE AMERICAN ALPINE CLUB
THE NATURE CONSERVANCY
THE OREGON RIVERS COUNCIL
THE WILDLIFE SOCIETY
THIRD FORCE FOR FORESTRY
TIMBER FRAMERS GUILD OF NORTH AMERICA
TROUT UNLIMITED-COLUMBIA RIVER CHAPTER
VIRGINIA 4WD ASSOCIATION
WALDO WILDERNESS COUNCIL
WESTERN FOREST INDUSTRIES ASSOCIATION
WESTERN WOOD PRODUCTS
WILLAMETTE FORESTRY COUNCIL
WILLAMETTE HIKERS
WILLAMETTE KAYAK AND CANOE CLUB

Individuals

List is complete. To save paper during these reviews, the list was retained at the Forest.

LETTERS FROM PUBLIC AGENCIES

APPENDIX I

LETTERS FROM PUBLIC AGENCIES

FEDERAL AGENCIES

USDA, Forest Service, Pacific NW Range & Experiment Station L-1
US Department of Air Force L-6
US Department of Energy, Bonneville Power Administration L-8
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UNITED STATES DEPARTMENT OF AGRICULTURE — Forest Service — PNW, Corvallis

017085

Reply To: 4060

Date: May 31, 1988

Subject: Willamette National Forest Plan

To: Forest Supervisor
Willamette National Forest

I am sorry my response to the Forest Plan is late. I recently had surgery and am two to three weeks behind. I do not think my comments on the Plan are particularly controversial, but I do feel they are important and hope you will still be able to consider them. My comments will pertain only to Research Natural Areas (RNAs) and I will deal with each planning document separately. I will then make some comments of a more general nature.

DRAFT ENVIRONMENTAL IMPACT STATEMENT

p. III-132 The discussions of most of the wilderness areas are primarily oriented toward recreation, though other uses of wilderness are mandated in the wilderness legislation. The existence of the Middle Santiam RNA is discussed in the section on the Middle Santiam Wilderness, yet the importance of that research area to the wilderness and its management implications are not discussed. Scientific research in wilderness is as important as recreation and the RNA provides an excellent opportunity for this.

p. III-155 1) In the section on Middle Santiam RNA, first paragraph, the word successful is used. I am sure the plan means "successional". 2) The last paragraph on the page discusses the Mt. Washington proposed RNA. I believe the plan is actually referring to the McKenzie Pass proposed RNA. I'm not sure where the Mt. Washington name came from, but this confusion should be cleared up.

p. III-157 1) In the paragraph at the top of the page discussing the demand for RNAs I think it would add a great deal if the role of RNAs in protecting biological diversity was mentioned. 2) In the fourth paragraph reference is made to the recreation use at Torrey-Charlton RNA. I think this is probably an internal matter, but the issue of recreation use at this proposed RNA has always been controversial. Since special reference is made to it in the plan my guess is that the issue remains controversial. My understanding was that a cessation of the present fish stocking program might occur on 1 or 2 of the small lakes, but that this was to be an agreement between the forest, ODFW, and PNW (memo on 5/1/81 from District Ranger to the Forest Supervisor). I am not exactly sure what is meant by the statement in the plan, but I think that the issue needs to be discussed again when the establishment report is written.

p. IV-159 In the second to last paragraph on the page the plan states that extensive timber harvest adjacent to RNA boundaries could reduce the effective size of some of the included cells. This statement, though true, makes me somewhat nervous. I would hope the forest would go to whatever lengths necessary to protect the integrity of the RNAs and to protect the biological diversity within their boundaries.

p. IV-160 In Figure IV-15-1 two proposed RNAs are misidentified. Mt. Washington should be McKenzie Pass, and Mt. Hagan is actually Hagan Block.

p. IV-161 The figure and the discussion on the effects the different alternatives would have on the RNAs is somewhat confusing. It discusses retaining percentages of the RNAs in undisturbed conditions. I would assume that any RNA appearing in an alternative would be 100% protected. What kinds of disturbances are implied here and how are the percentages arrived at? For instance Alternative J, preferred, shows 1% of the RNAs being effected by full development. What is this referring to?

p. IV-162 Under b. other losses worth mentioning would be losses to biological diversity and losses to information gained from baseline monitoring.

LAND MANAGEMENT PLAN

p. IV-99 Under Timber Management 2. I am unaware of anywhere in the Forest Service Manual where it allows salvage timber harvest in RNAs. This entire section should be eliminated as it is not correct.

p. V-7 Under Validation Monitoring it would be useful to see the role of RNAs discussed here. RNAs will play an important role in monitoring and this is rarely, if ever, mentioned.

Appendix A-26 In the discussion of research use of the Middle Santiam Wilderness I find the statement that "only those studies and programs that absolutely require a Wilderness environment will be permitted" rather contrary to the establishment of the Middle Santiam RNA (which preceeded the Wilderness establishment) and to the goals of wilderness which include scientific use. The issues of research use of wilderness and the establishment of RNAs in wilderness were discussed in some detail in the Fall 1985 RNA meeting. The minutes of this meeting and the Forest Service Wilderness Research Policy direction were sent to every forest. The minutes and the policy direction say nothing about absolutely requiring a wilderness environment for RNAs or research. This statement in the plan is distressing because it seems to negate not only the importance of research in wilderness, but the very existence and efficacy of RNAs in wilderness. I feel the statement should be removed.

Appendix C I did not go over the proposed timber action plan in detail to see where timber sales might possibly effect RNA boundaries. In regard to timber sales (or other management activities) the Forest Service Manual states (4063.04.6):

> District Rangers...report through the Forest Supervisor to the Station Director any planned activities on, or immediately adjacent to, research natural areas.

Generally speaking the Willamette National Forest has done the most thorough job of any forest in dealing with RNAs - what they are, how they fit into overall forest management, and what kinds of problems and benefits they provide. It is hard to pin down but I sense that recreation is perceived as a legitimate use of RNAs. Though the manual does not specfically forbid

recreation use, unless it compromises the objectives of an RNA, I have seen instances where once recreation patterns are established they are close to impossible to change, even if harm is being done. I encourage the Willamette Forest to take a cautious and conservative approach to recreation use of its RNAs. As more and more of the forest is cut and as recreation use increases the integrity of the RNAs is going to be more at risk. The Forest Plan recognizes this risk to integrity, but I am not sure the connection is made to on going recreation use in RNAs. It seems much better to discourge, recreation use now and avoid conflicts that will surely arise in the future. I think this is an issue that will need to be adressed in the establishment reports and the management plans. I certainly hope to be a part of this process.

Sarah Greene

SARAH E. GREENE
Research Natural Area Scientist
Pacific Northwest Region

cc:

Fred Swanson, PL/S
Miles Hemstrom
Margaret Petersen
ASD/South, PNW

UNITED STATES DEPARTMENT OF AGRICULTURE — Forest Service — PNW, Corvallis

014657

Reply To: 1920 Date: May 12, 1988

Subject: Willamette Forest Plan

To: Forest Supervisor
Willamette National Forest

These comments concern the Willamette National Forest Draft EIS and represent part of the review of pertinent sections of the Forest Plan by scientists in the Managed Forest Watersheds work unit, U.S. Forest Service Pacific Northwest Research Station, Corvallis, Oregon. My comments are directed specifically at two sections of the DEIS: 1) Affected environment - Water (Chapter III, pages 15-37); and 2) Environmental Consequences of the Alternatives on Water (Chapter IV, pages 15-39). Taken together with the review by Dennis Harr, these comments constitute our reaction to this section of the Forest Plan.

Rather than focussing on planned actions under specific alternatives, I will address some of the procedures and assumptions underlying determination of water and sediment outputs and consequent effects for comparison of alternatives. All of the National Forests are in the difficult position of having to predict and plan for environmental effects of various alternatives on water and soil at a time when understanding of water and sediment movement in response to management is still rudimentary. Moreover, there is no consensus within the scientific community as to the best methods for conducting this analysis. Given this context, the approach outlined in the Plan, though untested, is reasonable in my opinion.

A number of items in the narrative and tables do, however, deserve clarification.

Affected Environment-Water (Chapter III, pages 15-37)

III-29, para 3-4: I think it's important to emphasize that natural and management-augmented erosion rates discussed here and presented in table III-E-8 represent material eroded by surface erosion and debris slides from the hillslope and potentially available for transport to and through the stream network. Actual volume of material delivered to streams may be greater or less, depending on factors such as how well sediment sources are integrated into the drainage network (i.e. ditch-lined roads are likely to be greater sediment producers than ungullied clearcuts) and the extent to which other sediment sources, such as deep-seated mass movements, which are not accounted for in the soil erosion rates, are active in a particular basin.

You should also direct the reader to Appendix B, pages B-61 to B-67 for discussion of how these numbers were arrived at. The issue of the watershed sensitivity index is discussed below; however, para. 4 should be clarified to read "... a sensitivity index which primarily reflects a watershed's potential to transport eroded material to its stream network has been developed."

III-29, para 6-7: From a water quality standpoint, absolute erosion rates (natural or otherwise) are more important than percent increase above natural, since sediment problems (turbidity, siltation) often accompany streams which are high sediment producers naturally. This fact is accounted for in the sensitivity index which deals in terms of natural erosion rates.

III-30, para. 1: The statement "...presence or absence of large woody debris...is the most important factor in whether sediment inputs affect channel stability or aquatic habitat" is highly questionable. Woody debris is one of several factors, volume, rate, and size of sediment delivered, channel gradient, geometry, and flow regime being others, which determine whether sediment affects channels. The claim that 30% increases in sediment load can be accommodated without deleterious effects if enough wood is present is also open to question.

Environmental Consequences of the Alternatives (Chapter IV, pages 15-39)

IV-16, para 4: The contention that small headwater streams are those most sensitive to changes in riparian condition is open to debate and depends on the riparian zone process in mind. The statement may be true from the standpoint that streams in this part of the landscape do not have well developed floodplains or riparian zones which tend to buffer disturbances such as sediment production from adjacent hillslopes. Headwater streams may be more resilient to loss of other riparian zone functions such as shading, however, because topography and proximity of hillslope vegetation may ameliorate loss of streamside stands. The reverse is true in riparian zones along larger streams.

IV-17-18. I am concerned that treating the issue of riparian zone harvest at the project level precludes planning for recruitment of woody debris of different sizes, ages, and species composition to streams over the course of a rotation and along the entire channel. Without at least some watershed- to subdrainage-scale planning, there are few guarantees that the 'mosaic of partial and no-cut areas' will be achieved. While the current round of planning is not likely to address this issue, it needs to be considered in the future.

IV-19, para 1: How will the "varying width" of riparian zone along Class I, II, and III streams to be withdrawn from timber harvest be determined?

IV-19, para 2-5: Since the 'Watershed Sensitivity Index' figures prominently in both the sediment and cumulative effects analysis, it deserves a detailed look. Overall, I think that developing an index of basin sensitivity is a reasonable approach to evaluating potential sediment impacts; in particular classing basins into Low, Medium, and High risk is an appropriate strategy where insufficient data and poorly-understood processes make more quantitative methods open to debate.

I do have some reservations, however, about how the specific index was derived and what it means. As described, it represents an unweighted average of four factors: 1) natural erosion rates (a measure of the intrinsic erodibility of a basin); 2) elevation below 4000 ft (hence susceptibility to rain-on-snow events); 3) drainage density (a measure of the probability that sediment eroded

from the hillslope will be delivered to a channel); and 4) percent of time the basin experiences flows greater than or equal to two times the average annual flow (a measure of the 'peakiness' of the hydrograph). The index is therefore a hybrid of both sediment production potential (factors 1 and 2) and transport potential (factors 2,3, and 4).

Aside from a few inconsistencies in how some of these factors were calculated (i.e. the rankings of the natural erosion component in Figure IV-2-2 do not correspond to natural erosion rates given in III-E-8 and some of the reported averages are in error), there is the question of how well the index predicts true basin sensitivity to sediment impacts. One problem is that the four factors are not independent of each other; for example, the discharge and elevation factors are strongly correlated (due to importance of rain-on-snow in generating peak flows). So the index is weighted towards basins which score high on these two factors.

Another problem is that the index only indirectly addresses a number of key factors, including: 1) the channel's efficiency at transporting material; 2) the sensitivity of the channel to changes produced by sediment transport; or 3) sources of erosion other than surface or shallow mass movement. For example, 5 of the streams with high sensitivity are described on page III-32 as showing little evidence of sediment deposition because of bedrock controlled channels. On the other hand, sensitivity ratings of two streams (Breitenbush and Middle Santiam) were increased based on outside information because the index did not treat points 2 and 3, respectively. The index should do an adequate job of identifying 'sensitive' basins or reaches within basins; otherwise, there is no way of knowing whether ratings for basins in addition to the two mentioned above should be changed.

IV-23, para 1: This is a confusing section since the statement that first decade sediment effects are not expected to decline for several of the Alternatives is at odds with Fig. IV-2-4 which shows declining yields for all alternatives except C, D, and F.

IV-26, para 2: The statement that effect of increased peak flows are probably greatest if they occur in addition to increases in sediment load is not strictly true, since the increases may be compensating (i.e. greater sediment load is offset by increased stream power due to higher peak flows).

IV-26, para 3: The hydrologic recovery threshold should be identified for each sensitivity class (i.e 'average' sensitivity = 75% recovery, etc.).

IV-31, para 1: The actual values of erosion and hydrologic recovery used to classify basins into Possible, Probable, or Unlikely categories should be specified. Similarly, the terms 'substantial' or 'small' in talking about number of basins affected by 10-year events should also be quantified.

IV-31, para 2: The cumulative effect rating suffers from the same uncertainty as the watershed sensitivity rating in that current or potential impacts are only assessed indirectly through a calculated increase in erosion and a hydrologic recovery factor. There is no real measure of past or intrinsic

basin 'response' to use as a yardstick for evaluating potential future response to alternatives.

In conclusion, these comments are not intended to detract from the considerable amount of good work and thought that has gone into formulating these sections of the Plan, but to encourage you and your staff to tighten up some of the concepts and language prior to presenting this document in its final form.

Sincerely,

Gordon Grant

GORDON GRANT
Hydrologist

cc: Fred Swanson, PL/S

United States Department of Agriculture | Forest Service | Pacific Northwest Research Station | Forestry Sciences Lab 3200 SW Jefferson Way Corvallis, OR 97

Caring for the Land and Serving People

Reply to: 1920 Land and Resource Management Planning Date: January 4, 1988

Subject: Proposed Land and Resource Management Plan

[redacted]

Supervisor
Willamette National Forest

RECEIVED JAN 1988

I have reviewed the Willamette's Proposed Land and Resource Management Plan and accompanying documents. I concentrated on the sections dealing with [redacted] although I did review other sections in a more cursory manner. I paid close attention to the material dealing with rain-on-snow and peak streamflows and found that the authors of this material did an excellent job interpreting my research publications.

I think the Willamette's conservative stance relative to harvest's effects of rain-on-snow runoff and landslides is the most prudent route that can be taken at this time. As more and better research information becomes available, you should be able to refine your methodologies for assessing effects of rate of harvest on rain-on-snow runoff and landslides.

Enclosed is a list of specific criticisms and suggestions to improve the Plan. If more detail is needed, I can be reached at FTS 420-4387.

R. Dennis Harr

R. DENNIS HARR
Supervisory Research Hydrologist

Enclosure

cc's: Kennick, Edmonston, Legard, Lemons
Edwards
VanSickle, RIG.
Joyner
Gagne, DET.

REVIEW COMMENTS ON THE WILLAMETTE NATIONAL FOREST'S
PROPOSED LAND AND RESOURCE MANAGEMENT PLAN, DEIS, AND APPENDICES

PROPOSED LAND AND RESOURCE MANAGEMENT PLAN

page II-7,top: The statement that "all of the Benchmarks generated water yields within 3% of natural levels through the fifteenth decade" does not seem to be supported by the numbers in Table II-B-1. If "natural" water yield is 8.4 million acre-feet/year, the 8.9 million acre-feet in Table II-B-1 represents an increase of 6%, not the 3% claimed. And water yield is shown through only decades 1-5, not 15.

On page III-17 is the statement again that total water yield from the Forest is 8.4 million acre-feet/year yet Table III-E-7 on page III-27 of the DEIS again shows 8,895,098 acre-feet/year. Which is it? On page III-26 of the DEIS is the statement that it's both. I don't understand the use of the two numbers.

page IV-2: The second goal statement under Water Resources doesn't seem to make any sense. How can volume of water provided be increased by maintaining the carrying capacity of streams? What is the carrying capacity of streams as used in this goal statement?

page IV-5, para. 2: The statement "As ten years is not that long in the life of a forest..." needs to be changed. How long is "that long?" I suggest saying "ten years is only a small fraction of the lifespan of a forest" to make the point about time.

page IV-74 (and elsewhere in this section): Item 3 under "water and soil management" states that soil compaction shall not exceed limits that prevent natural plant establishment and growth..." Some rewording would be helpful. The way it is stated now, one might wonder why you are concerned about soil compaction beyond the point when plant establishment and growth are hindered. You want to prevent soil compaction that hinders plant establishment and growth, right?

DEIS

page III-28 para. 2: Stress of fish may occur at 64 degrees Fahrenheit, but this doesn't mean that once water temperature reaches 64 degrees that fish are in trouble. I think the way this is presented implies a very simple situation that belies the complexities of the real world. Fish are able to seek refuge from heat in deep pools that stay cool. I believe the studies from which the 64 degree-temperature was derived also kept fish at constant temperatures, some at 64 degrees and others at other temperatures. In streams, water temperature may be high during the day but may be lower during night and morning hours. Thus, fish aren't exposed to constant high temperatures as they are in the lab studies of the kind that produced the 64 degrees.

ure IV-2-2: The implications of two of the footnotes are disturbing to me. th the Breitenbush and Middle Santiam watersheds were placed in the high sensitivity category because of documentation supplied by Gordon Grant. Judging by the index number for these two watersheds, they would have been otherwise ranked medium. How many other watersheds are in the wrong category because of the lack of information about them? The watershed sensitivity method appears suspect if it does not take into account the situations of the Breitenbush and Middle Santiam watersheds. A watershed sensitivity methodology must take into account deep seated mass movements that are as obvious as they are in the Middle Santiam watershed. These mass movements are almost in the "common knowledge" category, and it's difficult to understand why they weren't included.

Page IV-25: If this Proposed Plan is rewritten, the description of rain-on-snow could be strengthened by including two additional references that were published after the Plan had gone to print. The two references are:

Harr, R. Dennis. 1986. Effects of clearcutting on rain-on-snow runoff in western Oregon: a new look at old studies. Water Resources Research 22(7):1095-1100.

Berris, Steven N. and R. Dennis Harr. 1987. Comparative snow accumulation and melt during rainfall in forested and clear-cut plots in the western Cascades of Oregon. Water Resources Research 23(1):135-142.

These additional references support what has already been written in the Proposed Plan. Incidentally, the Harr (1986) reference cited on page IV-25 should be Harr (1987) as the proceedings of the 1986 conference weren't published until 1987.

DEPARTMENT OF THE AIR FORCE
REGIONAL CIVIL ENGINEER, WESTERN REGION (AFESC)
630 SANSOME STREET - ROOM 1316
SAN FRANCISCO, CALIFORNIA 94111-2278

M0124

MAR 1988
RECEIVED

ROVP (Hunt/556-0415)

Willamette National Forest Land and Resource Management Plan Draft Environmental Impact Statement (DEIS)

Forest Supervisor
Willamette National Forest
221 East Seventh Ave.
P.O. Box 10607
Eugene, OR 97440

1. We appreciate the opportunity to review the subject DEIS and offer the following comments:
   a. As shown on the attached map, the Willamette National Forest is subject to military overflights in the form of low-level training missions. Inasmuch as low-level overflights do have the potential to disrupt the solitude and naturalness of areas directly under their flight paths, we recommend you include consideration of such activities in your discussion and decision-making process. Within that context, we further recommend you consider location, altitude, and frequency of flights.
   b. Areas which are appropriate for military overflights and low altitude training routes are becoming increasingly rare. In selecting overflight training routes, the Air Force must consider mission requirements and fuel costs as well as environmental constraints. Ideally, training routes are located within areas which: are relatively isolated, have diverse topography and minimal commercial activity, maintain sparse human populations, and contain lands under federal jurisdiction. It is obvious that these characteristics are also desirable to a large degree with National Forests and potential wilderness areas. Therefore, even though the Willamette National Forest is subject to air training activities, the Air Force generally supports your Land and Resource Management Plan provided such a proposal, and subsequent management thereof, does not restrict use of the airspace for military overflights.

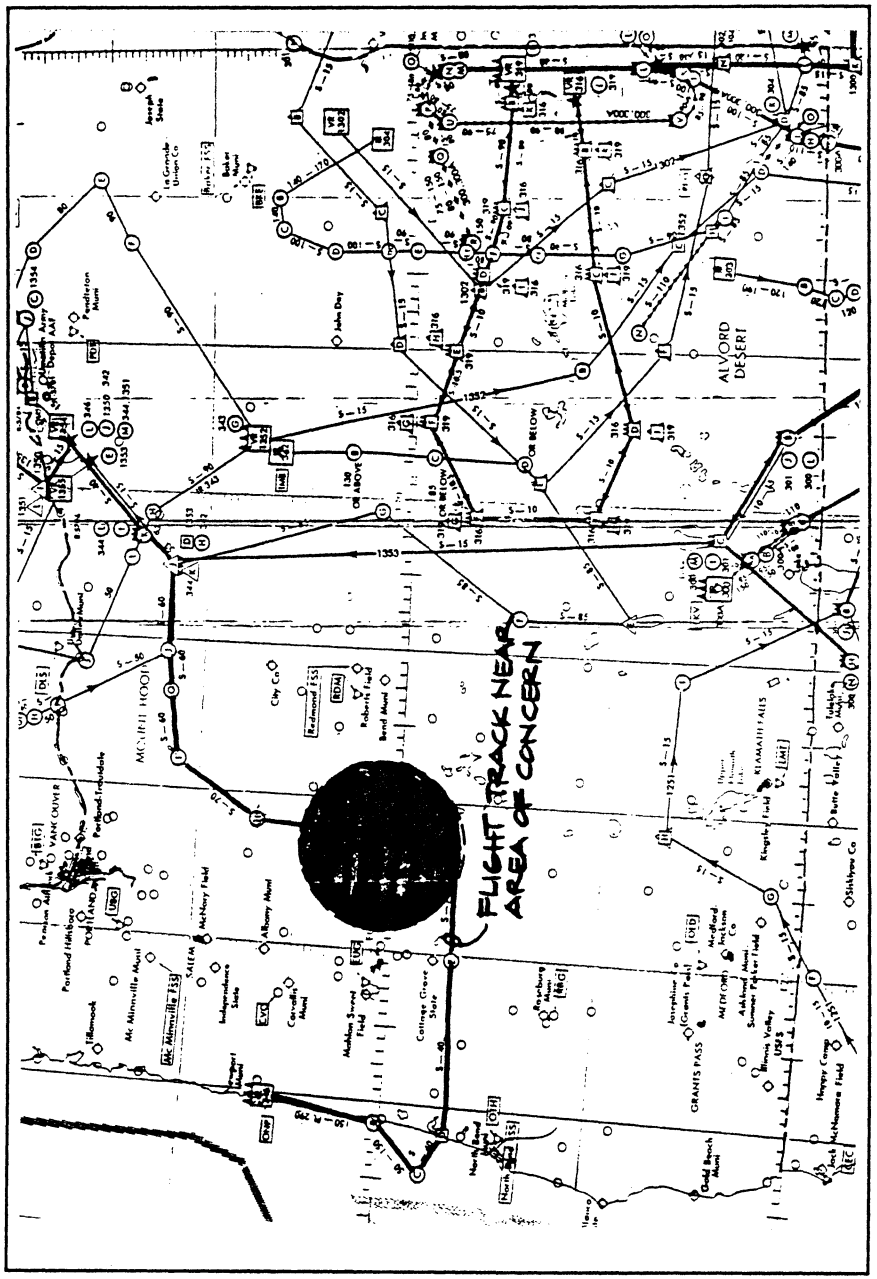
2. We hope these comments are useful in your planning process. If we can be of assistance in any manner, please contact the undersigned or Capt Kerry M. Hunt at (415) 556-0415.

Phillip E. Lammi

Phillip E. Lammi, Chief
Environmental Planning Division

1 Atch: Training Routes Map

cc. AF/LEEVX



DEPARTMENT OF THE AIR FORCE
REGIONAL CIVIL ENGINEER, WESTERN REGION (AFESC)
630 SANSOME STREET - ROOM 1316
SAN FRANCISCO, CALIFORNIA 94111-2278

001E05

MAR 25 1988

ROVP (Farrel/556-0882)

Draft Environmental Impact Statement (DEIS) - Proposed Land and Resource Management Plan, Willamette National Forest, Oregon

Land Management Planning
Willamette National Forest
Federal Building, 211 E. 7th St.
PO Box 10607
Eugene, OR 97740

1. We appreciate the opportunity to review the subject DEIS and offer the following comment:

As shown on the attached map, the Willamette National Forest is subject to one military overflight route (IR 346) in the form of a low-level training mission. This particular mission has been authorized to operate as low as 200 feet above ground level during daylight hours and 800 feet above ground level at night.

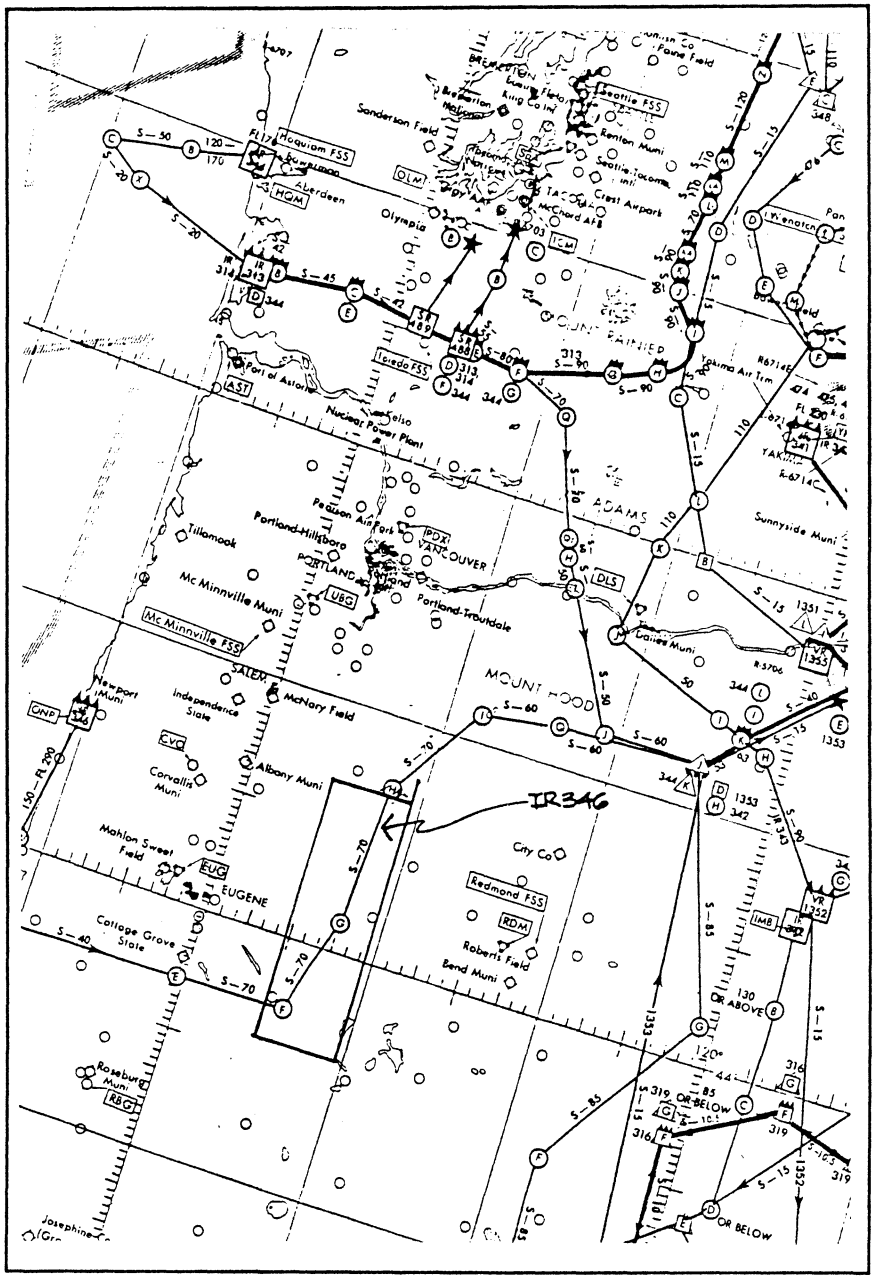
Geographic areas which are appropriate for military overflights and low altitude training routes are becoming increasingly rare. In selecting overflight training routes, the military must consider mission requirements and fuel costs as well as environmental constraints. Ideally, training routes are located within areas which are relatively isolated; have diverse topography and minimal commercial activity; maintain sparse human populations; and contain lands under federal jurisdiction. These characteristics are also generally compatible with National Forest Systems. Inasmuch as low-level overflights do have the potential to disrupt the solitude and naturalness of areas directly under their flight paths, we recommend you include consideration of low-level training missions in your discussion and decisionmaking process wherever solitude and naturalness are desirable attributes within the forest system.

2. If we can be of further assistance in any manner, please contact Mr. David Farrel, at (415) 556-0882.

Phillip E. Lammi

PHILLIP E. LAMMI, Chief
Environmental Planning Division

1 Atch: Training Routes Map



Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

017099

In reply refer to: AJ

MAY 25 1989

Forest Supervisor
Willamette National Forest
221 E. 7th Avenue
Eugene, OR 97440

Dear Sir:

We have reviewed the Willamette National Forest Draft EIS for proposed Land and Resource Management Plan.

In reviewing the proposed Land and Resource Management Plan and DEIS, it is not possible to determine specifically how the Forest standards, guidelines, and alternatives would affect energy corridors and energy resources, particularly biomass, hydro, and geothermal. Since the Willamette National Forest, manages over 109 miles of the Cascade Range, it is an important link between the majority of Oregon energy loads (which lie in the Willamette Valley) and the major energy resources to the west of the Cascades. Therefore it is important that the Forest Service make explicit provisions for managing existing transmission corridors and providing for future corridors.

Our specific comments on the draft Management Plan and EIS are enclosed. Thank you for the opportunity to review these documents. If you need clarification of these comments or additional information, please contact me at (503) 230-5136 (FTS 429-5136).

Sincerely,

Anthony R. Morrell
Assistant to the Administrator
for Environment

Enclosure
BPA Facilities Map

cc:
J. Cheek, PP&L, Portland, OR
Sipe, USFS Region 6, Portland, OR

Celebrating the U.S. Constitution Bicentennial — 1787-1987

Specific Comments

Proposed Land and Resource Management Plan

1. BPA and other utilities have transmission facilities located in the Willamette National Forest. BPA facilities found in the Forest are illustrated on the attached map. They should be specifically identified in the plan as well as in the draft EIS. By not specifically recognizing or designating existing facilities, the Proposed Land and Resource Management Plan does not recognize that some forms of resource management may be incompatible with utility siting and operations. The Plan must recognize that some areas may require restricted public access in order to protect the operation of existing utility facilities and/or the safety of the general public.

2. Chapter IV, Page IV-3, Forest Management Goals. A goal should be added which provides for cost-effective and environmentally acceptable energy transportation in accordance with regional energy policies and programs.

3. Chapter IV, Page IV-20, Forest Management Objectives (Lands). This section should also address the goals for transmission facilities or corridors, as well as electronic sites. The attached map shows BPA microwave communication sites found in the Willamette National Forest. This section should also address the need to meet regional and national energy programs, including the Pacific Northwest Conservation and Electric Power Plan, which has been adopted pursuant to the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L 96-501).

4. Chapter IV, Page IV-38, Forest Management Objectives (Minerals and Energy). The Energy section should address the need for Forest-wide standards and guidelines to provide for the establishment and use of existing and planned utility corridors, and to encourage both the efficient use of energy resources and price moderation of gas and electric service in the West.

5. Chapter IV, Pages 53, 54, Forest-Wide Prescription (Minerals and Energy). This section should also address biomass and hydro energy resources. They do not fit under the definitions listed.

6. Chapter IV - 55, Forest Wide Prescription (Land Uses). We are pleased to see that the Forest has left corridor windows available through areas near Emigrant Pass, Willamette Pass, McKenzie Pass, Santiam Pass, and the North Fork of the Breitenbush River. These windows interconnect with the Deschutes National Forest, and will help maintain important energy transportation options across the central Cascades. The Windigo Pass, however, was not mentioned, and should also be included as an alternate corridor window. It was specifically mentioned in Section 4(a) of the Oregon Wilderness Act of 1984 as an energy/transportation corridor through the National Recreation Area.

It would be helpful if corridor windows were illustrated on a facilities map. The attached BPA Facilities Map illustrates the corridor windows identified in the 1977 BPA/FS Pacific Northwest East-West Corridor Study. The C-13 corridor has been eliminated by the 1984 Oregon Wilderness legislation. As a result, alternate corridor windows were identified through the Willamette and Windigo Passes by representatives of BPA, PP&L, and the Deschutes and Willamette National Forests. We also recommend that the final EIS identify the corridor avoidance area constraints which may encumber these corridor windows.

7. Chapter IV - 67 to 182, Management Area Prescriptions. The Management Areas Standards and Guidelines do not mention utility corridors. It would be useful if they were to identify specifically the areas considered avoidance or exclusion areas. The Forest should consider establishing a management area specifically for corridors, as have the Mt. Baker-Snoqualmie and Gifford-Pinchot National Forests. The prescription should focus on forest and right-of-way management practices that provide responsible protection of energy facilities from fire and other hazards that affect the reliability of these facilities. The Standards/Guidelines for the new management prescription should reference the Project Plan and Right-of-Way Maintenance Plan as important documents which guide the construction and maintenance of BPA transmission rights-of-way. These documents are required by the BPA/Forest Service Memorandum of Understanding. As an alternative, many Forests have established a management area specifically dedicated to utility facilities (including corridors), with their own management standards and guidelines. For instance, the Gifford Pinchot National Forest in Washington has taken this approach.

8. Appendix B, Page B-11, Oregon Cascades Recreation Area. As mentioned above, the Windigo Pass Corridor should be included as an energy corridor option. Other than the Emigrant Pass corridor, Windigo Pass is the nearest alternative to the Willamette Pass Corridor window for energy transfer across the central Oregon Cascades.

9. Right of Facility Access. Utilities must have access to their facilities at all times for maintenance and in emergencies. This need should be recognized in the Forest Plan. Please contact BPA's Eugene District Manager to discuss actions such as land transfers, or proposed construction of buildings/structures near BPA facilities that could affect our access to those facilities or their reliability.

Mr. Ladd Sutton
BPA - Eugene District Office
Federal Building, Rm. 206
211 East 7th Street
Eugene, Oregon 97401
Tel: (503) 687-6952, FTS 425-6952

Project Specific Comments

BPA has funded only one fish and wildlife project on the Willamette National Forest, the Little Fall Creek Passage Project (denil fish ladder), Project Number 86-90. Funding for this project was provided under the Northwest Power Planning Council's 1984 Columbia River Basin Fish and Wildlife Program, Measure 704(d)(1). Currently BPA is providing funds to Oregon Department of Fish and Wildlife to maintain and operate the facility.

The Little Fall Creek passage facility is located on Weyerhaeuser Company lands. The Forest Service has completed habitat enhancement work on forest lands just upstream of the ladder. According to the Forest Plan, they anticipate conducting additional enhancement work on Fall Creek which Little Fall Creek is tributary to. BjPA supports the Forest Service's efforts to improve fish spawning and rearing habitat on the Forest.

General Comment

The preferred alternative does not identify riparian areas or indicate whether they will be protected. BPA believes that all riparian areas should be protected from any activity which will, to any extent, adversely affect these sensitive areas.

Draft Environmental Impact Statement

1. Summary, Page S-3, (Public Issues). The list of public issues approved by the Regional Forester included energy in 1981. We do not understand why this list was revised and energy removed as a priority issue. The last paragraph indicates the reason to be changes in public opinion. This change should be explained. Is it because of the temporary power surplus we are experiencing? If so, it should be realized that this surplus is only temporary and varies considerably from one portion of the Pacific Northwest to another. BPA still considers energy corridors and renewable energy resources to be issues of significance on all National Forest lands.

2. Chapter I, Page 1-10, Issues, Concerns, and Opportunities. As mentioned above, BPA feels that energy should have received more attention in the Proposed Plan and DEIS, and should be given consideration in the selection of a proposed alternative.

3. Chapter II, Page II-40, Alternate Goals and Management Objectives, (Goals and Objectives that Differ by Alternative). The impact of alternatives on energy resources is important. The differences should be identified and considered in decisionmaking. This section indicates that the amount of land withdrawn for entry for mineral and energy development will decrease. It should be more specific, indicating the approximate number of acres (by energy resource), and should also address hydro and small hydro sites. The same comment also applies to following alternate discussions.

4. Chapter II, Page II-122, Figure II-E-27c. This figure shows effects only on mineral exploration. It should also identify the effect of alternatives on energy resources (geothermal, hydro, biomass).

5. Chapter II, Page II-133,134, Economic Comparison of Alternatives. Economic values of mineral and energy resource development will vary by alternative. Although it may be very speculative, BPA strongly recommends that the Forest make some judgment of the effects, as this is important decisionmaking information.

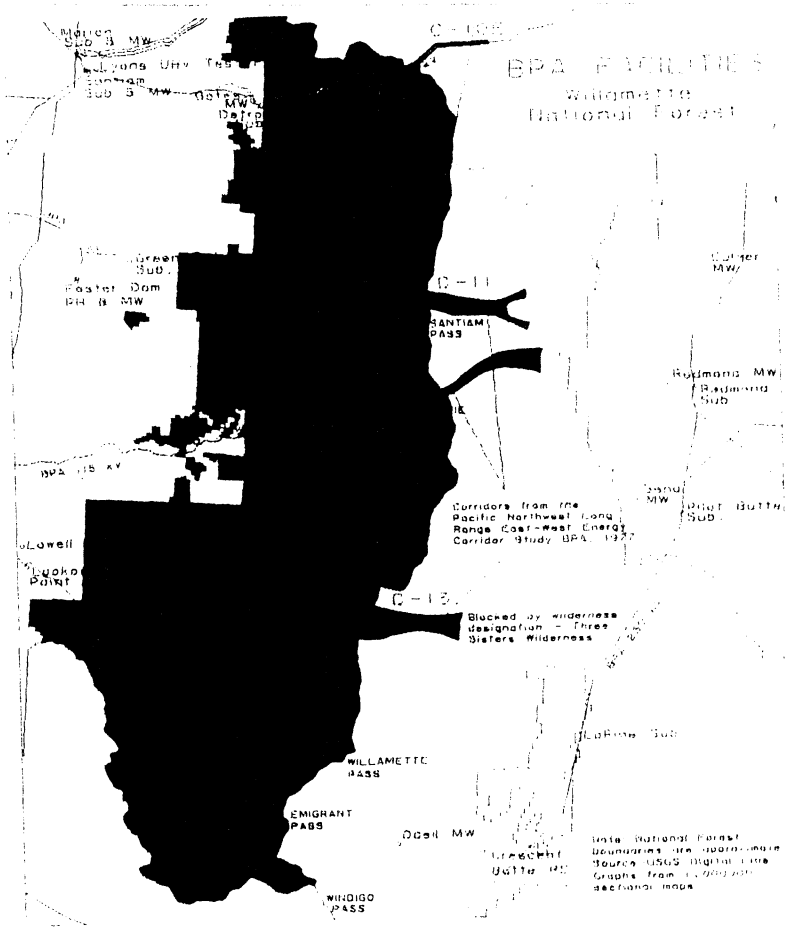
6. Chapter III, Page III-161, Affected Environment (Facilities). We recommend that a large-scale map be inserted here to illustrate the facilities found in the Forest. It should specifically point out the existing and potential corridors of BPA, PP&L, and Eugene Water and Electric Board.

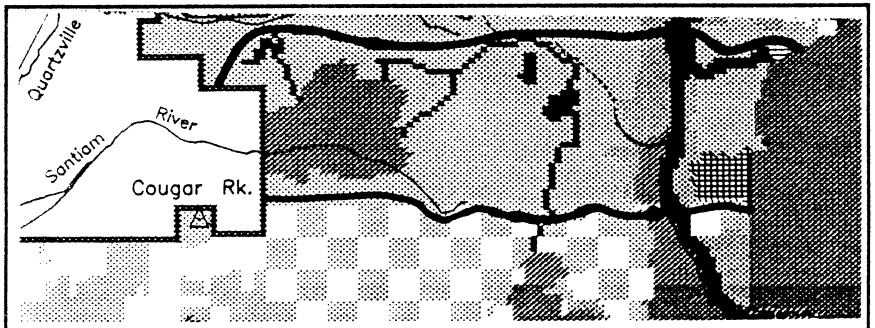
7. Chapter III, Page III-201 to 202, Affected Environment (Mineral Withdrawals). This section points out the extent of mineral withdrawals. If the alternate plans individually affect the amount of land withdrawn, then this information should be presented.

8. Chapter IV, Environmental Consequences of the Alternatives. There is no discussion of facilities or lands included, a major omission. The impact of the alternatives should be clearly defined. Such a discussion should include the impacts of alternatives on existing and potential corridors, as well as on electronic sites. The number of avoidance areas crossed should be discussed, along with a summary of the potential impacts, by alternative.

   The Forest Plan also does not evaluate the impact on energy policy and programs. As mentioned above, energy transportation is an important regional and national issue which the Forest has not adequately addressed.

9. Chapter IV, Page IV-185, Environmental Consequences of the Alternatives, (Environmental Consequences of the Alternatives on Minerals and Energy). The seventh paragraph references the other EIS documents for information on leasable minerals, including geothermal. The impacts of alternatives on these resources should at least be summarized, rather than leaving it to the reader to obtain these documents and do so himself. The Forest Plan and DEIS and the other documents referenced were written to aid in separate and distinct decisionmaking processes.





A) ALTERNATIVE J



B) ALTERNATIVE C



C) ONRC PROPOSAL

Figure 1. Alternatives for the Middle Santiam Wilderness-Mt. Jefferson Wilderness corridor.

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
500 N.E. MULTNOMAH STREET, SUITE 1692
PORTLAND, OREGON 97232

May 16, 1988

014652

ER 88/25

Michael A. Kerrick
Forest Supervisor
Willamette National Forest
211 E. 7th St., P.O. Box 10607
Eugene, Oregon 97440

Dear Mr. Kerrick:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan (PLRMP) for the Willamette National Forest, Oregon. The following comments are provided for use and consideration when preparing the final documents.

GENERAL COMMENTS

Fish and Wildlife Resources

The Forest Service has done a credible job in addressing the impacts of each alternative on a variety of resources. Threatened, endangered, and sensitive species have been covered in a particularly thorough manner.

An interagency agreement signed on December 1, 1987, by the Director of the Fish and Wildlife Service (FWS) and the Chief of the Forest Service commits the Forest Service to ensure the continued existence of a well-distributed northern spotted owl population throughout its National Forest range. Under the agreement, both agencies have agreed to coordinate efforts, including research and monitoring. An annual progress report will be supplied to the FWS and the agreement provides for emergency action if a viable population is not maintained. The final documents should refer to this interagency agreement. The terms of the agreement should be reflected in relevant sections such as standards, guidelines and monitoring.

Alternative J, the preferred alternative, appears to be a "middle-of-the-road" choice. Two other alternatives (F and D) provide greater protection to the environment and do not deviate significantly from the allowable timber cut associated with Alternative J. Since the Willamette Forest contains most of the available old-growth left in the Willamette Valley (most of the old-growth on private lands having been cut), it is important that more of this valuable resource be conserved (on a percentage basis) on this Forest. Selection of a preferred alternative should, therefore, reflect this conservation need.

Threatened and Endangered Species

Comments pertaining to threatened and endangered species have been provided by the FWS in a separate letter (dated April 26, 1988) to the Forest. A copy of that letter is attached. Briefly summarized, the Forest planning documents and the Biological Evaluation provide adequate Forest-wide standards and guidelines to ensure that each Forest action will be reviewed in a manner consistent with the Endangered Species Act of 1973, as amended. In general, proposed monitoring programs are also satisfactory. The planning documents could be improved by listing the sensitive species present on the Forest, adding productivity and winter roost surveys to the monitoring programs, and by developing site-specific management plans for bald eagle winter roost areas.

Wild and Scenic River Resources

The National Park Service (NPS) has expressed two major concerns with the analysis of Wild and Scenic River potential in the Forest Plan. The first is with the scope of the analysis. Section 8.11 of the Land and Resource Management Planning Handbook clearly directs the Forest to study rivers that have been identified in other assessments, including the Pacific Northwest Rivers Study. The Breitenbush; Little North Fork, North Fork, Middle Fork, and South Fork Santiam; South Fork and other mainstem segments of the McKenzie; and the Middle Fork and North Fork Middle Fork Willamette River were all recognized as having outstanding values in the Pacific Northwest Rivers Study. We feel that the Forest Plan is incomplete without an evaluation of the Wild and Scenic River potential of these rivers.

The second concern is with the procedures used to evaluate the Wild and Scenic River potential of the one segment of the McKenzie River that was evaluated. Despite ambiguities in the definition of outstandingly remarkable values, the eligibility analysis is adequate. However, in the assessment of classification we found no discussion of the criteria for land use, access, and degree of disturbance that are integral to a classification analysis. The classification analysis should include an analysis of the "scenic" potential in addition to the "recreational" potential. In addition, we have two problems with the suitability assessment which was conducted. First, a discussion of values foreclosed and curtailed in each of the options should not be done without a similar evaluation of values enhanced by designation. Second, there is no discussion of other Handbook criteria for suitability, including the characteristics which do, or do not, make the river a worthy addition to the System, status of land ownership, State and local interest in protection, and estimated costs of the protection program.

Given the significance of the rivers on the Willamette National Forest, a more careful and comprehensive analysis of Wild and Scenic River potential is essential. Another public review (of the river analysis), prior to the finalization of the Forest Plan, is in order. Two options are suggested: 1) The Forest revise the analysis, publish it as an amendment or a supplement to the PLRMP and DEIS, and incorporate the analysis and review comments in the final plan and FEIS; or 2) The Forest defer the Wild and Scenic River analysis until after release of the final plan and FEIS, provided that all potentially eligible rivers are managed in a manner that is consistent with section 8.12 of the Handbook, "Interim Management of Study Rivers."

Cultural Resources

Much of the information from the DEIS would be more appropriately discussed in the PLRMP. We found the Preferred Alternative to be deficient in detail for cultural resources.

The final Plan should summarize (1) what, and where, Section 110 (National Historic Preservation Act) inventory is now being done (if any), and (2) what inventory is targeted for the next 10 years.

The Plan should provide evidence that the Forest is working with the State Historic Preservation Office to carry out its cultural resource investigations in accordance with Statewide planning priorities.

Although the Cultural Resource Inventory Plan is still under preparation, the final Forest Plan should incorporate at least the essential ingredients of the Inventory Plan as discussed on page III-88 in the DEIS.

Mineral Resources

In general, the treatment of minerals is somewhat cursory and non-specific compared to other National Forest Plans. Nevertheless, the DEIS does contain a reasonable historical account of mineral resource activity. Unfortunately, the discussion does not address mineral potential, which is essential for planners to know how to address future activity.

This may be due to the preceived low mineral potential throughout the Forest. As a result, there is little description or analysis to effectively compare the impacts on potential mineral resource development for the various management alternatives. Furthermore, the Summary of the Analysis of the Management Situation omits discussion of mineral resources, except for the notation that refined information regarding the location of mineral and energy related resources, and probabilities of development, is needed.

The mining district map on page III-199 (DEIS) is inadequate to portray mineral potential. It should be at the same scale as the alternative maps and should provide more detail than is presently available. This would allow an easier comparison of the data through the maps and thus permit the reader to visually evaluate how mineral resources will be affected. The best example to date is the Okanogan National Forest (Washington) EIS.

The current map shows four mining districts which include the majority of the larger mines; however, Bureau of Mines records show eight additional areas within the Forest that have had mineral activity. Two of those have recorded production.

The text should explain how the geology is related to ore deposition. Some geologic environments suitable for mineral deposits may not have been explored or claimed by individuals or companies. Examples of such environments which could exist in this Forest are gold, mercury, and other metals occurring in a geothermal environment or deeply buried porphyry in a granitic intrusive environment. Wilderness and RARE II studies of nearby areas by the Bureau of Mines and Geological Survey mention these potentials.

Discussions of the roadless areas in Appendix C are quite brief and could be expanded. More data on mineral resources, as well as illustrations showing where the areas of mineral potential exist within the roadless areas, are needed.

Figure IV-19-1 uses a comparison format that is most helpful; however, a reference to the criteria used to determine mineral potential could not be found. We suggest that the Forest consider the one used on the Wallowa-Whitman National Forest, Oregon.

We suggest the Forest provide a narrative section on minerals containing history of development and mineral production, value of past production, projected mineral demand, and current operations in locatable, leasable, and salable minerals. The Wallowa-Whitman EIS contains one of the best examples.

There is no mention of current mining claim activity. According to Bureau of Land Management records, there are 2,100 mining claims encumbering 42,000 acres of Willamette National Forest land, or 2.5 percent of the total Forest. The lack of adequacy of text and questionable minerals terminology, imply a serious lack of minerals expertise among the authors of the EIS.

The Forest needs to add a list of current mineral withdrawals to the appendices. It should contain the acres involved and the mineral potential for locatable and leasable minerals. An excellent example is contained in the Los Padres National Forest (California) EIS.

A mining information section should also be added to the appendices. This section should contain definitions of mining exploration and development terms, what the operations involve, and the effects these activities have on the Forest. The Beaverhead National Forest EIS contains an excellent example.

The effects of the proposed management plan on known mineralized areas should be more thoroughly described. What is in the "special interest area" in the Blue River mining district? How will this and the "scenic" designation in the Blue River district affect mineral development from a practical aspect? This same question can be applied to the North Santiam mining district. The management in that district is either wilderness or some variation of scenic management.

Ground-Water Resources

The documents should address the subject of water supply for the visiting public and for staff, indicating measures to prevent and mitigate impacts on this resource, such as judicious selection of water-supply sources, periodic monitoring of drinking-water quality, and treatment, if necessary. Sanitary facilities should be discussed, whether primitive or involving treatment, and the potential for ground-water impacts from these facilities should be assessed. If disposal of municipal or industrial solid waste or sewage effluent occurs on the Forest, effects should be assessed. The statement mentions the significance of the Forest for ground-water recharge. Effects of timber harvest, recreation, grazing and vegetation management on ground-water recharge should be addressed.

SPECIFIC COMMENTS

DEIS

Page II-77, Old-Growth Grove, paragraph 1. Salvage harvest limitations should be defined here. It is unclear if salvage harvest operations within the old-growth grove would be limited to annual entry, very limited amounts of timber removal, etc. If salvage operations are not specifically defined (and limited), the value of these old-growth groves for education and public enjoyment will decrease significantly.

Page II-81 through 115. A resource management program for minerals has not been included.

Page II-103, Water, paragraph 1. The final document should note that erosion in areas far removed from a stream can also cause problems if the riparian areas have been logged, i.e., there are limited amounts of riparian vegetation left to hold back soil.

Page II-112, Figure II-E-22. This figure shows the amount of large mature and old-growth timber that will remain at the end of decades 1, 2, 5 and 15. It would be helpful to know what percentage of the various acreage figures will be old-growth timber. Defining this percentage would then give a better idea of which alternatives favor old-growth retention over the timber harvest period.

Page II-113, Roadless Lands, paragraph 1. This section should point out that roadless lands, while not suitable for motorized use by highway vehicles, can be accessed, and sometimes damaged, by Off-Road Vehicles (ORVs).

Page III-29, paragraph 2. This discussion should be expanded to note that high turbidity can damage the gill surfaces of young fish.

Page III-39, Vegetation. The final document should list the acreages of each of the different plant communities associated with the Forest.

Page III-48, Riparian Zones. It would be useful to the reviewer to know the present condition of the riparian vegetation within the Forest.

Page III-86. The priorities and schedule for documenting and determining the eligibility of the 36 potential archeological and historic districts need to be clarified.

Page IV-16, paragraph 2. The final document should indicate what the percentage of harvest per decade is in drainages less than 40 square miles and what effect this harvest percentage has on water quality in smaller watersheds.

Page IV-19, paragraph 1. Because the riparian corridor is an extremely valuable habitat resource for a wide variety of wildlife species, FWS recommends that the Forest Service allow for generous buffers along Class I, II and III streams, and consider additional protection for these areas in terms of more harvest entry withdrawals.

Page IV-53, Effects on Old-Growth, paragraph 2. This section indicates a minimum of 410,000 acres of old-growth will be maintained. This statement should reflect that this acreage is a combination of old-growth and large mature timber (as stated on page II-111).

Page IV-72, paragraph 4. This paragraph should reflect the impacts on stream temperature associated with tree removal in riparian areas. Increased temperatures can have a significant impact on fish productivity.

Page IV-106, paragraph 3. The 20 percent figure referred to in this section as the potential population management goal for primary cavity excavators (PCE) is excessively low. The FWS recommends that the 60 percent management level goal provided by the Oregon Department of Fish and Wildlife be adopted for PCE populations.

Page IV-185. The effects of withdrawals, access restrictions, and stipulations placed on approvals of Plans of Operations and leasing stipulations have a very direct effect on the economic attractiveness of the Forest to mineral exploration and development activities.

Page IV-186, Effects of Alternatives on Minerals and Energy. Greater clarity would be provided by inclusion of one or more map themes and discussion depicting locatable/salable/leasable mineral potential by major commodity groups, as well as areas currently or anticipated to be affected by low to restricted access designation for each Management Alternative.

Page IV-190, Fig. IV-19-3. Acreages of moderate potential for geothermal given in this table do not agree with the 18,344-acre figure on page IV-187.

Page IV-193. In some circumstances, geothermal may be considered a renewable resource through induction of ground water.

Page L-1. We recommend that the list of companies and organizations to whom copies of the Plan/EIS are sent should include the Pacific Northwest Chapter of the Geothermal Resources Council, the Northwest Petroleum Association, the Northwest Mining Association and the Northwest Power Planning Council.

DEIS - APPENDICES

Page B-35, Management Prescription - 7b, paragraph 3. The final document should indicate how often, on the average, that salvage operations are necessary in old-growth areas.

Page B-188, Figure B-H-1. The impacts would be clearer if deer were included in the "Wildlife, Fish, and Plant Habitat" column.

Page B-202, Alternative J (Preferred), paragraph 3. This paragraph should define what the ratio of old-growth to mature timber is at the end of the second decade. The final document should also indicate the rate at which the old-growth is cut during this time period. The FWS is concerned that too much reliance is being placed on the mature timber being able to supplant the old-growth over time. Cutting the old-growth at an accelerated rate may be leaving more of the "back-up" mature timber vulnerable to catastrophic events (disease, fire, floods) which could lead to drastic, irreversible declines in the amount of old-growth on the Forest.

PROPOSED LAND AND RESOURCE MANAGEMENT PLAN

Page II-1-10. No mention is made of the existance or economic importance of minerals within the Forest even though the affected counties contain several thousand mining claim filings--a majority of which are on the Forest. The Willamette NF is encompassed by four mining districts with reported past precious metal production, includes important industrial mineral resources, and has known geothermal hot springs and KGRA's. The latter areas have potential energy resources that may have significant projected dollar value. A recent publication that may aid in reviewing geothermal potential was released by BPA: Evaluation and Ranking of Geothermal Resources for Electrical Generation or Electrical Offset in Idaho, Montana, Oregon, and Washington, by R. G. Bloomquist, et al. This apparent deficiency in mineral information is partly acknowledged by the concluding item in Part F which notes the need for refined information on mineral resources and development potential.

Page II-7, paragraph 2. The FWS suggests that the final document address any point or non-point pollution sources that could affect water quality on the Forest.

Page IV-5. Neither the 10 or 50 year future condition of the Forest mentions minerals as either a desired recreational or economic opportunity.

Page IV-17, Cultural Resources. The statement "In managing cultural resources, emphasis will be placed on conducting inventories of site areas of proposed ground disturbing projects on a stratified basis" should be clarified.

Page IV-18. It would be helpful to have some discussion in the text of the projected cultural resource actions listed in Figure IV-D-6 "Projected Cultural Resource Program." This discussion should include at a minimum the identification and prioritization of Management Plans, National Register district nominations, and non-project related inventories.

Page IV-24, paragraph 1. This paragraph should indicate that increased human use of these old-growth areas will probably lead to a decline in use of the areas by old-growth dependent species.

Page IV-38, Item p. The discussion of Minerals/Energy is non-specific and indicates that more lands will be withdrawn from mineral entry. It is strongly recommended that all lands currently withdrawn or slated for withdrawal from mineral entry be carefully and periodically reviewed. Nearly 40 percent of the Forest is already withdrawn or anticipated for high restrictions impacting mineral activity. Economic value and recreational opportunities associated with casual prospecting or mineral development should be considered.

Page IV-69-182, Fig. IV-F-1. These sections and figures should indicate or reference suitable depictions elsewhere in the Plan that show the areal extent of the Forest open, withdrawn, or restricted to mineral entry in relation to the several Management Areas (1a-14). This concern could be partly mitigated by reference to DEIS Figures IV-19-1 through 4.

Page A-14, Wilderness Management. The discussion here should include reference to valid existing rights.

We appreciate the opportunity to review these documents.

Sincerely,

for Charles S. Polityka
Regional Environmental Officer

United States Department of the Interior

00381

FISH AND WILDLIFE SERVICE
Portland Field Office
727 NE 24th Avenue
Portland, OR 97232

April 26, 1988

Michael A. Kerrick, Forest Supervisor
Willamette National Forest
221 East Seventh Ave.
P.O. Box 10607
Eugene, Oregon 97440

Dear Mr. Kerrick:

The Fish and Wildlife Service (FWS) has reviewed your December 24, 1987 Biological Evaluation for the following forest planning documents for the Willamette National Forest (Forest): the Draft Environmental Impact Statement (DEIS), the Proposed Land and Resources Management Plan (Plan), and Appendices - Draft Environmental Impact Statement (Appendices). The following comments are being provided to you as part of informal consultation 1-7-88-I-17. These comments are specific to threatened and endangered species and are being forwarded to you in addition to comments provided by the Department of the Interior on the DEIS and Plan.

GENERAL COMMENTS

Forest-wide standards and guidelines are adequately developed and appear to offer the necessary programmatic guidance for the review of forest actions and their impact on threatened and endangered and sensitive species.

Bald eagle winter roosts are not specifically targeted in the "overall" or the "specific" standards and guidelines. Special management considerations may be necessary for these areas beyond the general measures described in the Forest guidelines and the Biological Evaluation. We encourage the development of site-specific management plans as roosting and foraging habitats for listed species are identified.

The Pacific States Bald Eagle Recovery Plan identifies stable or increasing winter populations of bald eagles as a criterion for delisting this species. Therefore, it is important for the Forest to provide for long-term monitoring of known winter use areas. Annual winter monitoring of bald eagle populations should be included within the Forest's monitoring programs (Plan - Page V-11) and these efforts should be coordinated with the Oregon Department of Fish and Wildlife and the Pacific Bald Eagle Working Team.

Based upon information in the Biological Evaluation and the Forest planning documents, it appears that potential habitats for bald eagles and peregrine falcons are in areas where harvest entry will be limited or prohibited, thereby protecting potential habitat for these listed species. The FWS, therefore, concurs with your finding of no direct or long-term adverse impacts to bald eagles or peregrine falcons.

The planning documents should include a published list of the 21 sensitive species identified as occurring on Forest lands. Some of these species may be Federal candidate or proposed species and should be identified as such for conservation and monitoring purposes.

The Oregon chub, Oregonichthys crameri, is a Federal candidate, Category 2 species. The Oregon chub was not included in the Biological Evaluation.

SPECIFIC COMMENTS

Proposed Land and Resource Management Plan

Page IV-15, Figure IV-D-4. Since the peregrine falcon is a management indicator species for threatened and endangered species, it should also be listed in the figure.

Page IV-17. Threatened and Endangered Species, paragraph 2. This section should clearly identify management direction for bald eagle roosting and foraging sites, both active and potential (see GENERAL COMMENTS).

Page IV-17. Threatened, and Endangered Species, paragraph 3. The final Plan should publish the list of "sensitive" plant species referred to in this paragraph. It is not clear if Federal candidate species are included on this list (see GENERAL COMMENTS).

Page IV-47 and 48. Section A, Bald eagle and Peregrine falcon. Operational considerations should be included. General operational considerations include FSM 2670, the Endangered Species Act, and 50 CFR Part 402. More specific operational considerations include site-specific management plans, and management prescriptions listed under Management Area 8 and in specific Section 7 consultations with the FWS. The need to review all Forest actions for potential effects to listed species should be clearly stated in this section. It should also be clearly stated that the Forest is required to consult with the FWS on any action which may affect listed species.

Page IV-63. Threatened, Endangered, and Sensitive Species, paragraph 4. The FWS may be contacted for technical assistance particularly if proposed or candidate animal or plant species are involved.

Page IV-110. Management Area 8. Item 1a. Site-specific management plans should be developed for all newly discovered nests and roost sites within a specified time frame in consultation with the FWS.

Page IV-110. Management Area 8. Wildlife Management. A fourth item should be added on monitoring which emphasizes the need to conduct productivity and winter use surveys in cooperation with Oregon Cooperative Wildlife Research Unit, Oregon Department of Fish and Wildlife, and the FWS.

Page IV-111. Management Area 8. Recreation Management. Item 2. Developed recreation sites should be monitored to determine the potential for disturbance to listed species.

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Pages IV-113 and 115. Management Areas 9a and 9b. Items 3 and 4, respectively. Introduction of exotic species should be discouraged to conserve sensitive species, such as the Oregon chub, and the natural ecosystems in which they occur. These items should be expanded to specifically discourage the introduction of exotic species.

Page V-12. Figure V-C-1. Sensitive plants. The final Plan should indicate, if possible, a percentage decline figure for sensitive plant species that will trigger further protective action on the part of the Forest. Also, it should be noted that the timing of the surveys for sensitive (or candidate) plant species is critical to obtaining complete data on the presence or absence of these populations.

Draft Environmental Impact Statement

Page III-55. Threatened, Endangered, and Sensitive Plants, paragraph 4. The final document should include the list of 21 sensitive species, the habitats with which they are associated, and a brief description of how the list will be updated or maintained.

Page III-70. Figure III-J-1. Bull Trout. The final document should indicate that the bull trout is a Federal candidate, Category 2 species.

Page III-79. Threatened and Endangered Species MIS: Bald Eagle, paragraph 5. The Forest should consider developing site-specific management plans for winter roost areas as this habitat for listed species is identified (see GENERAL COMMENTS).

SUMMARY COMMENTS

Based upon available information in the Forest planning documents and the Biological Evaluation, Forest-wide standards and guidelines appear to offer adequate programmatic guidance to assure that each Forest action will be reviewed in a manner consistent with the intent of the Endangered Species Act of 1973, as amended, and its requirements. The monitoring programs presented in the Plan also appear to offer a level of monitoring that will allow for an assessment of the effectiveness of the Forest's standards and guidelines for threatened and endangered species. The planning documents could be improved, however, by listing the sensitive plant species identified by the Forest as occurring on Forest lands, adding productivity and winter roost surveys to monitoring programs, and developing site-specific management plans for bald eagle winter roost areas and nest sites as they are identified.

Sincerely,

Roger E. Forderstrasse
for Russell D. Peterson
Field Supervisor

cc:
ARD-FWE
BFA(ERT)
FWS-SE 1-7-88-I-17
Polityka
OSU, OR Coop Wildlife Research Unit (Attn: Bob Anthony)
UC Davis (Attn: Jack Williams)

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00001

U.S. Department of Transportation
Federal Highway Administration

Region 10
Alaska, Idaho
Oregon, Washington

708 S.W. Third Avenue
Portland, Oregon 97204

January 11, 1988

In Reply Refer to:
HPP-010.2

Mr. Michael A. Kerrick, Forest Supervisor
Willamette National Forest
211 E. 7th Street
P.O. Box 10607
Eugene, Oregon 97440

Dear Mr. Kerrick:

Federal Highway Administration, Region 10, has reviewed the draft environmental impact statement for the Willamette National Forest Land and Resource Management Plan and offers the following comments for your consideration.

Oregon highway routes 20, 22, 126, 242 and 58, which are on the Federal-aid highway system, are within Willamette National Forest and Recreation Area. Quite often such highways in National Forest areas do not have defined right-of-way. To make highway improvements with FHWA funds on any of the above routes, or any Forest Highway System routes which may use any lands designated as recreation, requires a determination by FHWA that there is no other feasible and prudent alternative than the selected proposal. Without an adequately defined right-of-way, this has, in similar situations, caused considerable delay in project implementation and increased taxpayer expense.

We suggest the final EIS acknowledge that when right-of-way for Federal-aid highway routes or forest highway routes are not defined, a management effort will be made to work out such details with the government officials having operating responsibilities for that route.

Ideally, in any area designated recreation by you, the designated right-of-way should be of sufficient width to allow bridge replacements, roadway widening, or elimination of safety hazards, such as bad curves. Roadway improvements within a defined corridor designated for highway use do not require a 4(f) determination. NEPA action will apply to all highway improvements.

Sincerely,

E. J. Valach, Director
Office of Planning and
Program Development

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

MAY 1 3 1988

014681

REPLY TO ATTN OF WD-136

Michael A. Kerrick
Forest Supervisor
Willamette National Forest
P.O. Box 10607
Eugene, Oregon 97440

Dear Mr. Kerrick:

In accordance with our responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act, we have reviewed the Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan (Plan) for the Willamette National Forest (WNF). The WNF is located along the western slope of Oregon's Cascade Mountains and includes 1,675,408 acres. The preferred alternative upon which the Plan is based provides for intensive timber management, wilderness, and special riparian areas, among other options. Mineral exploration and development would also be permitted.

Based on our review, we have rated the DEIS EC-2 (Environmental Concerns - Insufficient Information). Enclosed is an explanation of our EIS rating system. The primary reason that we have environmental concerns is that Standards and Guidelines for water need to be more fully developed in the Final EIS/Plan, as does a water quality monitoring plan. The details of our comments are included in the enclosed review report. We were very pleased to have met with your staff on January 6-7 and December 16, 1987. This interaction was very useful to us in becoming familiar with the issues and current management practices of the WNF.

We intend our comments to be constructive, and we are confident that by addressing our concerns and comments the WNF can present a Final EIS and Plan which more clearly show that important resources will be adequately protected, while providing WNF staff with the necessary flexibility to manage the forest on a day-to-day basis. While our comments are lengthy, we wish to acknowledge that most components of both documents were well done.

Thank you for the opportunity to review the DEIS and Plan. If you have any questions about our review, please contact Ann Uhrich of our Environmental Review Section at FTS 399-8516.

Sincerely,

for Robert S. Burd
Director, Water Division

Enclosures

cc: ODEQ
ODFW
USFS, R-1
USFS, R-4
USFS, R-6
USFWS, Portland
NMFS, Portland
BLM, Portland

U.S. ENVIRONMENTAL PROTECTION AGENCY
COMMENTS ON PROPOSED LAND AND RESOURCE MANAGEMENT PLAN
AND DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE
WILLAMETTE NATIONAL FOREST, OREGON

GENERAL COMMENTS

Forest Management Process

One of the ways we assessed the environmental effects of the proposed alternative was how well the Willamette National Forest's (WNF) Draft Environmental Impact Statement (DEIS) and Plan described the forest management process. By forest management process we mean those components which describe the "how to" of forest management with regard to protection of natural resources. They can include the set of actions, decisions, or data which are needed to comply with environmental standards, prevent adverse effects, and improve existing environmental conditions. Important components of the forest management process as we see them are described as follows:

A data base of existing conditions from which technical experts and the public can judge the expected effects and level of uncertainty of the predictions.

Best Management Practices (BMPs) and management area prescription development and implementation.

Selection of BMPs for a particular activity and how uncertainty of BMP effectiveness is factored into selection and implementation.

Through on-site inspection and administration during an activity, verifying that a particular activity is occurring as prescribed in contracts, leases, or permits.

Environmental monitoring before, during, and after the completion of certain activities to determine whether impacts were accurately predicted.

A feedback loop that is built into the process such that forest activities causing significant problems will be corrected before they are allowed to continue.

Upgrading of BMPs or prescriptions to correct inaccurate predictions.

The use of NEPA for project implementation.

The DEIS and Plan effectively describe the interrelationship between most of these components. The Implementation Flow Chart (Plan, p. V-2) and the Decision Flow Diagram (Plan, p. V-19) were particularly helpful in describing feedback loops. The commitment to and role of on-site inspections in meeting standards and guidelines is one component that would benefit from further explanation.

Final environmental decisions on site-specific projects will determine to a significant extent the adequacy of the level of protection provided for water quality and other resources. The Final Plan should summarize or cite the criteria that will be used to determine when categorical exclusions, environmental assessments, and environmental impact statements will be used in Plan implementation, especially with regard to assessing impacts to water quality and beneficial uses. This would provide guidance and direction to Forest staff, and a general awareness of how these assessments will be used to interested and affected publics. It would also strengthen the accountability of the Forest in implementing the Plan.

Water Quality Standards Compliance

Management activities conducted in the WNF must be consistent with Oregon's adopted Statewide Water Quality Management Plan. This includes compliance with Oregon's Water Quality Standards (WQS) and monitoring the effectiveness of achieving compliance. The Plan and DEIS do recognize, at various points, the importance of these considerations. However, there is no specific reference to OAR 340, Division 41 (Oregon's adopted Water Quality Standards) in the Standards and Guidelines Section of the Plan, in the Minimum Management Requirements, or on page IV-36 of the DEIS.

From information provided in the DEIS, there is no real assurance that Oregon Water Quality Standards will consistently be met. For instance, the DEIS mentions that anadromous fish spawning occurs in the WNF. It also states that there are 638,600 acres of old growth habitat (p. III-51). This is about 38 percent of the Forest. The location of the spawning areas relative to the old growth is not identified. If harvest occurs in old growth areas which also support salmonid spawning, use of the streams could be adversely affected due to sedimentation (DEIS, p. IV-71 to 77). This could constitute a violation of the antidegradation policy of Oregon's Water Quality Standards. Compliance with Oregon Water Quality Standards must be assured.

The FEIS should address compliance with the State's antidegradation policy. This policy states that "where the existing quality of the water is better than the standards set, that such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses of such water and will not result in water quality less than that prescribed in the standard." This policy is reiterated in Federal regulations (40 CFR 131.13(a.2)). Many of the rivers in the Forest are high quality waters. The FEIS should describe how MMRs, Standards and Guidelines, BMPs, and other measures designed to minimize water quality impacts from Forest activities (e.g., road construction, timber harvest, mining, dam construction/operation), will ensure consistency with the antidegradation policy.

The status of Outstanding National Resource Waters is conferred to rivers designated as Wild and Scenic. For these waters, the antidegradation policy of the Water Quality Standards Regulations explicitly prohibits any lowering of water quality (40 CFR Section 130.12). There is one potential Wild and Scenic River on the WNF, and one existing State Scenic Waterway (DEIS, p. III-19). The FEIS should discuss in detail how degradation of these waters will be prevented, given the mining, timber harvesting, and roading activities which may occur in some of the Forest's drainage basins containing or tributary to these rivers.

Water Quality Monitoring Plan

NEPA requires that EISs include discussion of mitigation of potential impacts. Without a detailed monitoring plan, it will be difficult for the Forest to comply with the Council on Environmental Quality's NEPA regulations which require that an EIS shall contain: "means to mitigate adverse environmental impacts (40 CFR 1502.16(h))." When adverse effects on water quality and fisheries are potentially significant, they must be mitigated. A detailed monitoring plan needs to accompany major mitigation activities in order to measure their effectiveness and ensure that necessary corrections are implemented.

NFMA also provides the basis for a monitoring plan. The National Forest System Land and Resource Management Planning Regulations (36 CFR 219.11(d)) state that a Forest Plan shall contain a: "Monitoring and Evaluation Requirement that will provide a basis for a periodic determination and evaluation of the effects of management practices." Since the effects of management practices for timber outputs can significantly affect water quality and fisheries, a detailed monitoring plan is warranted.

The development of a detailed water quality monitoring plan should be based on a list of current beneficial uses, present condition, and desired future condition for each stream or a watershed unit which is small enough to adequately protect the beneficial uses. The present condition and desired future condition can best be expressed in terms of the beneficial use (e.g. percent fish habitat capability). The monitoring plan should include types of surveys, location of sampling, parameters to be monitored, indicator species, budget, procedures for using data or results in plan implementation, and availability of results to interested and affected groups. Enclosed is a copy of our monitoring guidance. Appendices A and O of the Final Nez Perce National Forest Plan, October 1987 includes the level of detail and approach to water quality and fishery monitoring which we believe is appropriate.

A watershed resource inventory summarizes facts, recorded measurements, observations, and other evidence which can be used to determine management objectives for rivers and streams. Oregon's water quality standards and water quality management plans, for instance, were developed using inventory information. As you are aware, an inventory is a key element needed for effective resource management. The drainage objectives derived from the resource inventory then provide a means of evaluating the effectiveness of plan implementation.

To assist with the overall water quality management program, we have developed a water quality summary sheet. The purpose is similar to that of a "Fact Sheet" used to evaluate NPDES permits. A draft copy for the Siskiyou National Forest is being enclosed as an example. The intent is to identify a form for watershed resource inventories which could be used by EPA and the Forest Service to address water quality concerns. Streams listed under "Drainage Objectives" only represent a starting point. The WNF is encouraged to expand this list.

The Plan (chapter IV) and DEIS (p. II-30) recognize that MMRs, Standards and Guidelines, and BMPs are a means to achieve and maintain WQS. It should be emphasized that implementation of these techniques does not constitute compliance with WQS. Measuring WQS compliance is accomplished through water quality monitoring programs. Evaluating the effectiveness of meeting water quality standards on the WNF will be difficult without a monitoring plan which includes stream-specific references, water quality parameters, and sampling frequency. We would support the recommendation to establish a multi-agency technical work group in Oregon to address these concerns and to assist the USFS in developing a water quality monitoring program tailored to individual forests.

Domestic Water Supplies

Other beneficial uses of the water resource may be affected and need to be more thoroughly addressed in the Plan. For example, there are several municipal watersheds in the WNF (DEIS, figures III-E-4 and III-E-5). Are these unfiltered surface-water supplies? Under an EPA-proposed rule as required by the 1986 amendments to the Safe Drinking Water Act, an agreement must be reached with the Forest Service that would allow the municipalities to have watershed control in order for them to continue to use these sources without filtration. The proposed Plan should provide a specific indication of how protection of these water supplies will be achieved.

SPECIFIC COMMENTS

Draft Environmental Impact Statement

S-9 We are pleased to see an alternative ("C") which emphasizes protection of "the soil, water, and air resources of the forest."

II-67 The preferred alternative will provide old-growth habitat for 91 pairs of spotted owls. This is lower than the full inventory of 152 verified pairs (DEIS, p. II-49). Is this reduction in existing habitat consistent with USFS policy presented in its EIS on the spotted owl? Is the MMR of 78 pairs (DEIS, p. II-106) also consistent?

II-75 We would recommend adding a footnote to the effect that all alternatives will contain about 22,300 acres of riparian lands which are to be withheld from harvest, even though riparian areas are not a management area per se.

II-128 In the comparison of issue and concern resolution, it is stated that for water quality and quantity, concerns will be met by MMRs. The WNF monitoring plan therefore assumes great importance as a mechanism to test the validity of this assumption, and to provide input for revisions to MMRs, Standards and Guidelines, and BMPs, if they are found to be ineffective.

III-3 through III-13 The discussions under Geology, Climate, and Soil are very good, particularly the recognition of the role played by each (along with vegetation) in slope stability. We are particularly pleased to see an acknowledgement of the need to incorporate information on active or potential avalanche areas into site-specific analysis during project design and implementation. We strongly support the use of watersheds and area analyses as planning tools and the Forest's effort to plan individual basin activities over space and time.

III-15 through III-32 The discussions under Water are very good, particularly the presentation of natural erosion levels (figure III-E-8) and their use in generating the watershed sensitivity index. There do appear to be a few errors in this figure, however. Salmon Creek should be "moderate" sensitivity (per p. IV-20), and "% Increase Above Natural" should be 74 for Tributary No. Santiam and 39 for Salt Creek.

III-36 We commend your discussion of potential air quality impacts from woodheating, and the role of WNF and other forests in supplying firewood.

III-64 In the third paragraph, there appears to be a typo, as 11 out of the 26 watersheds exhibit high erosion sensitivity indices.

IV-3 through IV-14 The discussion of impacts to soil resources is good, though the last paragraph on page IV-8 could be improved with information drawn from Appendix A, such as the statement that "the risks of significant, cumulative erosion and sedimentation effects in watersheds usually depend more on road quality and location, and the time of year when activities occur than on silvicultural treatments." Impacts to ground water (p. IV-3) would seem to be more appropriately discussed in the next section.

IV-15 through IV-39 The discussion of impacts to water resources is generally very good, particularly the cumulative effects assessment. Due to the higher risks of failing to meet minimum legal requirements, particularly with regard to water quality, EPA cannot support alternative NC.

IV-24 There are two errors in Figure IV-2-6. The 1986 erosion level should be 65 for Minor Tribs. McKenzie and 62 for Salmon Creek, per figure III-E-8.

IV--38/39 The discussion of monitoring on these pages would be a good addition to the monitoring section of the Plan.

Land and Resource Management Plan

II-9 We concur with the stated information needs relating to water quality and fish habitat.

IV-8 through IV-10 By virtue of the fact that every watershed on the Forest save one is the source for at least one if not several municipal water supplies and the fact that 14 of the 26 watersheds support anadromous fisheries, water is not simply a resource to protect during multiple-use management but is itself an "output." Water quantity is covered in this figure by "water yield" (p. IV-9), but water quality is not shown as an output. One could in part approximate it from "Anadromous Fish Use" (p. IV-8), but this category is not all-inclusive. We believe some method of measuring water quality (or some parameter thereof) should be added to this figure in the Final Plan.

IV-11/12 This is a very good discussion. It is one of the better "forest management process" descriptions we've seen in forest plans, in terms of how the Plan will trigger BMPs and mitigation measures.

V-2 This figure is very helpful in a general understanding of how the Forest would modify standards and guidelines. One area needs more clarity, however. What occurs between the "Execution of Annual Work Plans" and "Project/Program on Track"? Some type of monitoring?

V-5 through V-8 This is generally a good discussion; however, there is little detail nor any link to the existing or future resource inventories or plan output goals.

V-7 Under "Effectiveness Monitoring" we would assume that, due to various constraints, not all watersheds can be monitored. How will those that can be prioritized? The Plan should expand upon this issue.

In the last paragraph on this page, it is said that "monitoring will be done . . . based on relative importance." Again, how will monitoring efforts be prioritized?

V-9 Pursuant to the second monitoring question, how will permanent sampling points be selected? Will the Forest be coordinating with other federal and state agencies to take advantage of existing data bases, for example?

V-19 This figure is very helpful in a general understanding of how monitoring results will trigger further action, particularly changes in budget, schedule, or allocation.

Attachment A

USFS -- FOREST PLAN REVIEW

Water Quality Summary

Siskiyou National Forest
200 NE Greenfield Rd., P.O. Box 440
Grants Pass, Oregon 97526
(503) 479-5301

USFS File Number: OR-07
Draft Plan: August 1987

Significant Features

1,092,302 acres — Josephine, Curry, and Coos counties

Ranger Districts:

Chetco	(Brookings)
Galice	(Grants Pass)
Gold Beach	(Gold Beach)
Illinois Valley	(Cave Junction)
Powers	(Powers)

Major Basins: Rogue and South Coast

Major Rivers:

Rogue River	S.F. Coquille River
Illinois River	N.F. Smith River
Chetco River	Elk River
Sixes River	Hunter Creek
Pistol River	Euchre Creek
Winchuck River	

Aquatic Ecoregions:

Coast Range	(01)
Sierra Nevada	(05)

Special Protection:

179,850 ac.	Kalmiopsis Wilderness
26,708 ac.	Wild Rogue Wilderness
17,200 ac.	Grassy Knob Wilderness
5,323 ac.	Siskiyou Wilderness
3,414 ac.	Red Buttes Wilderness
5,226 ac.	Rogue Wild River
9,275 ac.	Illinois Wild River
2,541 ac.	Rogue Scenic River
5,436 ac.	Illinois Scenic River
3,959 ac.	Rogue Recreation River
542 ac.	Illinois Recreation River
37.0 mi.	Rogue River
50.4 mi.	Illinois River
13.0 mi.	N.F. Smith River
39.5 mi.	Chetco River

Background

The Siskiyou National Forest is located in Coast Range and Klamath Mountains of southwestern Oregon. [The forest is a diverse landscape of grasslands, sage, and juniper with mountain lakes and meadows.] Major coniferous tree species found in the Forest include Douglas fir, western hemlock, redwood, ponderosa pine, Port Orford cedar, sugar pine, and white fir. Hardwoods include tanoak, madrone, red alder, liveoak, manzanita, rhododendron, and golden chinquapin. Elevations vary from a few hundred feet to over 7,000 feet. Precipitation in the Siskiyou National Forest ranges from 30 to 150 inches annually. Most of this precipitation falls between October and April.

The Forest lies within two aquatic ecoregions: the Coast Range and the Sierra Nevada, which includes the Klamath Mountains. The Coast Range portion receives heavier amounts of rainfall (80 to 150 inches annually). Much of this region consists of perennial streams, typically having two to three miles of streams per square mile. The eastern part of the Forest is in the Klamath Mountain, or Sierra Nevada ecoregion. It receives 30 to 90 inches of rain annually and is drained mainly by perennial streams, although intermittent streams occur along headwater reaches and valley floors. In this ecoregion, there is a high potential for soil erodability.

Streams originating in the Forest support a diversified fishery, supply water for domestic use, provide for public recreational uses. Timber harvest, which has occurred extensively in some areas, is the principal industry found in the Forest. Hillslope and streambank erosion, resulting from logging and road construction, can be a serious problem as well as a major source of sediment streams. Large woody debris in headwater reaches may be transported during major storm events. This can cause scouring and increased sedimentation, which can lead to loss of habitat for stream biota. A variety of past and present mining practices, in certain areas, has also caused local disturbances to the biological habitat along streams.

The Siskiyou National Forest contains a highly diversified fishery ranging. Indicator species include fall chinook salmon, coho salmon, summer steelhead, winter steelhead, and resident cutthroat trout. Brook trout have been stocked by the Oregon Department of Fish & Wildlife in some Forest lakes. Non-salmonid coldwater fish which occur in the Forest include white sturgeon, green sturgeon, and American shad. Warm water game species include largemouth bass, bluegill, black crappie, and brown bullhead. Nongame species found in the Forest include redside shiner, carp, sucker, and sculpin.

Drainage Objectives

Drainage objectives identify the level of water quality or fishery habitat potential to be achieved in a given watershed. These are the basis of evaluating management options.

Watershed Number	Watershed Name	Beneficial Use	Current Status	Monitor. Needs
17100305-A-010	S.F. Coquille River	A/MW		***
020	Wooden Rock Creek	R		
030	Rock Creek	A		***
040	Johnson Creek	A		*
050	Sucker Creek	A		
060	Coal Creek	A		
17100306-A-010	M.F. Sixes River	A		
020	Sixes River	A		***
030	S.F. Sixes River	A		***
040	Dry Creek	A		*
050	N.F. Elk River	A		
060	S.F. Elk River	A		*
070	Elk River	A		***
080	Butter Creek	A		
090	Panther Creek	A		
100	Bald Mountain Creek	A		
17100310-A-010	Slate Creek	A		
020	Taylor Creek	A		***
030	Galice Creek	A		
17100310-B-010	Rogue River	A		***
020	Stair Creek	R		*
030	Blossom Bar Creek	A		***
040	East Creek	R		
050	Billings Creek	A		
060	Foster Creek	A		*
070	Shasta Costa Creek	A		***
17100310-C-010	Rogue River	A		***
020	Rans Creek	R		
030	Nail Key Creek	R		
040	Tom East Creek	R		
050	Wake Up Rilea Creek	R		
060	Bradford Creek	R		
070	Silver Creek	A		
080	Quosantana Creek	A		***

A: Anadromous Fish
R: Resident Trout
MW: Municipal Water

***: High Priority
* : Medium Priority

Watershed Number	Watershed Name	Beneficial Use	Current Status	Monitor. Needs
17100310-D-010	S.F. Lobster Creek	A		***
020	N.F. Lobster Creek	A		*
030	Lobster Creek	A		***
17100311-A-010	W.F. Illinois River	A		***
020	Elk Creek	A		
030	Broken Kettle Creek	R		
040	NF Rough & Ready Creek	R		
050	SF Rough & Ready Creek	R		
060	Rough & Ready Creek	A		***
17100311-B-010	E.F. Illinois River	A		***
020	Dunn Creek	R		
030	Althouse Creek	A		*
040	Sucker Creek	A		***
050	Left Fork Sucker Creek	A		
060	Cave Creek	A		*
070	Grayback Creek	A		***
17100311-C-010	Illinois River	A		***
020	Josephine Creek	A		***
030	Canyon Creek	R		
040	Fiddler Gulch	R		
050	Deer Creek	A		
060	Sixmile Creek	R		
070	Fall Creek	A		*
080	Rancherie Creek	R		
090	Dailey Creek	R		
17100311-D-010	Briggs Creek	A		***
020	Horse Creek	R		
030	Secret Creek	R		
040	Onion Creek	R		
050	Swede Creek	R		
060	Soldier Creek	A		*
17100311-E-010	Illinois River	A		***
020	Pine Creek	R		
030	Klondike Creek	A		*
040	Sulphur Creek	R		
050	Collier Creek	A		*
17100311-F-010	Silver Creek	A		***
020	Todd Creek	R		
030	Little Silver Creek	R		
040	S.F. Silver Creek	R		
050	N.F. Silver Creek	R		

A: Anadromous Fish
R: Resident Trout
MW: Municipal Water

***: High Priority
* : Medium Priority

Watershed Number	Watershed Name	Beneficial Use	Current Status	Monitor. Needs
17100311-G-010	E.F. Indigo Creek	R		*
020	Buck Creek	R		
030	Breezy Creek	R		
040	W.F. Indigo Creek	R		*
050	Snail Creek	R		
060	Indigo Creek	A		***
070	N.F. Indigo Creek	A		*
17100311-H-010	Illinois River	A		***
020	Horse Sign Creek	A		
030	Lawson Creek	A		*
040	Fox Creek	A		
17100312-A-010	Hunter Creek	R		
020	Pistol River	A		***
030	Meadow Creek	R		
040	E.F. Pistol River	R		
050	N.F. Pistol River	A		*
060	Sunrise Creek	R		
17100312-B-010	Chetco River	A		***
020	Little Chetco River	A		*
030	Carter Creek	R		
040	Baby Foot Creek	A		
050	Granite Creek	A		
060	Box Canyon Creek	A		
070	Tincup Creek	A		***
17100312-C-010	Chetco River	A		***
020	Boulder Creek	A		*
030	Eagle Creek	A		
040	Mineral Hill Fork	A		
050	S.F. Chetco River	A		***
060	Quail Prairie Creek	A		
070	Emily Creek	A		
17100312-D-010	E.F. Winchuck River	A		***
020	Wheeler Creek	A		*
030	Winchuck River	A		***
040	Bear Creek	A		
050	Moser Creek	A		
18010101-A-010	N.F. Smith River	A		***
020	Horse Creek	R		
030	Chrome Creek	R		
040	Baldface Creek	R		*

A: Anadromous Fish
R: Resident Trout
MW: Municipal Water

***: High Priority
* : Medium Priority

ATTACHMENT B

NATIONAL FOREST WATER QUALITY MONITORING RECOMMENDATIONS

GENERAL MONITORING GUIDELINES

Priorities. Greatest priority should be given to assessing fishery impacts in the following order: 1) endangered anadromous runs; 2) other anadromous runs; 3) resident salmonids; 4) and others, including warm water species.

Site Selections. Site selection for monitoring impacts on the above fish population should reflect the need for a representative range of environmental conditions, e.g., soil type, channel morphology, and erosion potential. Special attention should be given to watersheds with the greatest sediment production potential. Consideration must also be given to monitoring in heavily developed watersheds and in watersheds developed or disturbed in increments over time to evaluate cumulative effects upon fishery resources.

Paired Watersheds. Paired watersheds should be selected wherever possible, consisting of a representative stream reach in the watersheds to be developed and a comparable reach in an undeveloped watershed. Control (or reference) reaches should be selected based upon similarity in stream slope, elevation, streamside vegetation, bank stability, fishery, soil type, stream classification, etc.

Timing. Timing of monitoring should emphasize detecting impacts from first entry into a watershed. This may require prior monitoring to establish adequate baseline data in both the developed and undeveloped watersheds.

Frequency. Frequency and location of monitoring should be periodically adjusted to reflect needs or problems identified in the ongoing monitoring. Typically, monitoring at a specific site will be initially intensive, with a later shift to periodic trend verification.

Long-Term Monitoring. Certain aspects of the monitoring should be designed to evaluate impacts not detectable on a short-term basis. Examples are long-term stabilizaton of logging roads, recovery rates of degraded streams, persence of large woody debris, etc.

IMPLEMENTATION MONITORING

This on-site monitoring should evaluate the correctness of Best Management Practices (BMP) implementation. This information will be critical in determining whether adverse instream habitat impacts were caused by inadequate BMPs or improper implementation of BMPs. In general, however, we feel that the specific method used to evaluate the correctness of BMP implementation are best identified by the U.S. Forest Service (USFS).

EFFECTIVENESS MONITORING

Stream Monitoring Parameters. Both fish density (by species and age class) and fish habitat quality should be evaluated. Habitat quality should not be confined solely to substrate composition (e.g., cobble embeddedness and percent fine sediment by depth), but should also include such factors as pool/riffle ratio, amount and size of large organic debris, vegetative cover, channel morphology, etc. Data should be gathered by the most cost effective method while insuring data quality, and utilization of standard methods of measurement and analysis.

CALIBRATION MONITORING

The total monitoring effort should be carefully designed so that one outcome is to improve our ability to predict via models: 1) the actual sediment loading to a stream; 2) the actual impact of those sediments on fish habitat; and 3) the actual impacts of those sediments or other fish habitat changes on fish population.

INTERAGENCY SUPPORT/COORDINATION

Technical Fisheries Advisory Committee. To improve interagency coordination (and to provide technical assistance and support), we suggest that the USFS establish a technical fishery advisory committee in each state. This group could consist of representatives of government agencies who manage the resource or whose activities impact the fisheries resource. By meeting quarterly, or as significant issues arise, this group could identify, and hopefully resolve problems as they develop. They could also play a key role in assisting the USFS in preparing and presenting the annual monitoring report discussed below.

Annual Monitoring Report. We suggest that an annual public meeting be held to brief all parties on the monitoring results. To minimize travel costs, the USFS could review results from individual forests within a state at a single meeting. This would also facilitate comparison of results from different forests. The technical fisheries advisory committee could help the USFS develop, and present a consensus on impacts and needed actions.

Written material should focus on an analysis of planned vs actual actions and impacts. For example, where water quality problems occurred, the USFS should clearly define the nature and cause of the problems, the corrective actions taken, and the procedures to be used to prevent future occurrences. This material, together with supporting data, should be made available to all parties prior to the public meeting. A more formal written report summarizing long-term trends and impacts should be prepared periodically, possibly at 5-year intervals.

SUMMARY OF THE EPA RATING SYSTEM
FOR DRAFT ENVIRONMENTAL IMPACT STATEMENTS:
DEFINITIONS AND FOLLOW-UP ACTION *

Environmental Impact of the Action

LO--Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC--Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA intends to work with the lead agency to reduce these impacts.

EO--Environmental Objections

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3--Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment

February, 1997

MORRIS L. BRUSETT
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NORTHWEST POWER PLANNING COUNCIL

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014673

May 11, 1988

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Idaho

Michael A. Kerrick
Forest Supervisor
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

We appreciate this opportunity to review and comment on the Willamette National Forest Draft Environmental Impact Statement (DEIS) and the Proposed Land and Resource Management Plan (LRMP). The Council recognizes the enormity of the task undertaken in developing a plan for all forest natural resource management activities and appreciates the staff's effort to date in addressing the wide variety of issues.

The Northwest Power Planning Council is charged with developing a program to protect, mitigate and enhance fish and wildlife affected by hydropower development in the Columbia River Basin. The Columbia River Basin Fish and Wildlife Program, developed by the Council, focuses direction and sets specific actions to accomplish this charge (see attachment). Extensive public participation went into the formation of the program and has continued during its fine-tuning and implementation. It is projected that during the next three years Bonneville ratepayers will invest an estimated $50 million per year to implement the program. The estimate does not include the additional costs of lost revenue to the power system which may range from $20 - $50 million per year. This level of investment in time and dollars reflects the commitment by the Council, the fish and wildlife agencies, Indian tribes, Bonneville, federal project operators and regulators, utilities, and the public to solve basin fish and wildlife problems.

Management activities on the Willamette National Forest, which contains a significant portion of the Willamette River drainage, could potentially impact Council actions designed to improve salmon and steelhead resources. They could also impact actions to mitigate for wildlife losses due to hydropower development and operation. As a result, we hope that the Forest Service will take steps to insure coordination with the Fish and Wildlife Program. In addition, since the program will continue to evolve, we believe it is important that the Forest Service revisit the plan periodically and make changes to maintain coordination with newly adopted fish and wildlife objectives within forest boundaries.

It is particularly important that the Forest Service coordinate with the Council and others during the development of the systemwide plan for salmon and steelhead in the Columbia River System, and acknowledge efforts in this regard in the Willamette Forest Plan. The Council recently initiated this significant planning effort to attempt to identify ways to double salmon and steelhead runs in the basin. The effort, which could take up to three years, includes planning at the local level to identify fish production objectives and constraints, and at the system level to integrate these objectives. Forest representatives are working with fish agencies, tribes and others at both the local level and the system level during the process. The results of this effort will guide future program activities to increase salmon and steelhead in the basin.

We recognize that certain activities on the forest could detrimentally affect the success of actions taken to increase fish production by 1) increasing the disparity between seasonal streamflow levels, 2) increasing sediment production or otherwise reducing water quality levels, 3) degrading riparian area conditions, and 4) otherwise decreasing the quality or quantity of habitat to support existing and potential forest salmon and steelhead and wildlife production. Such potential impacts will be taken into account during system planning as planners identify strategies to reach the doubling goal. We hope that by coordinating our efforts we can ensure that the watershed conditions needed to support enhanced populations will be provided.

It appears that the Forest Service may be relying primarily on funds available through the Council's program and from other sources for fisheries restoration and enhancement. While we strongly support Forest actions to improve these resources, it may be premature to depend on such funds. The majority of funds to increase basin salmon and steelhead resources will not be earmarked for specific actions until completion of the systemwide plan. We hope that through system planning the Forest Service and others may coordinate actions to effectively achieve the conditions needed to support desired future salmon and steelhead resources.

In addition, to address the effects of hydropower development and operation on wildlife in the Columbia River Basin, the Council established a process to mitigate for wildlife losses (Section 1003(b)). The process includes developing wildlife plans and mitigation programs at each hydroelectric project in the basin. Currently, a plan is being developed to mitigate for wildlife losses in the Willamette River Basin. We encourage the Forest Service to continue working with the Oregon Department of Fish and Wildlife and others in the development and implementation of this plan.

In summary, our objective is to ensure that plans adopted to direct forest management actions are coordinated with regional efforts to rebuild salmon and steelhead runs. We believe that efforts to double

existing runs will likely prove inadequate unless they are coordinated and integrated systemwide. We particularly hope the Forest Service will make necessary revisions upon completion of system planning to bring its plan into coordination with any future plans adopted by the Council.

Again, thank you for this opportunity to comment. We would be happy to meet with you or your staff to discuss system planning in more detail. If your staff would like to arrange a meeting or needs more information, please call Barbara Taylor at 503-222-5161.

Book included with original (to Hill; if not received in copy)

Sincerely,

Edward Sheets

Edward Sheets
Executive Director

LARRY L. CAMPBELL

REPUBLICAN LEADER — January 1, 1983 - September 1, 1987
HOUSE OF REPRESENTATIVES

February 5, 1988

Mike Kerrick
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mike:

The importance of the Willamette National Forest Plan to the economic health of this area cannot be overstated. An adequate, stable timber supply is essential for a healthy timber industry; a healthy timber industry is essential for this area to participate in the "Oregon Comeback".

The Willamette National Forest is the major source of timber for mills from Salem to Cottage Grove. In addition, the taxes from harvested timber provide vital dollars for our schools and roads. Finally, it should be noted that at average annual wages of between $25,000 and $30,000, the jobs provided by the industry are at a level which allows workers to buy homes, raise families and pay taxes without looking to government for assistance. In contrast, jobs in the service sector frequently pay from $10,000 to $14,000, a level which makes it difficult for those workers to live without government help. It is clearly evident that to ensure economic prosperity we should make every effort to keep the industry healthy.

As proposed, preferred Alternative J would reduce the available supply of timber by 21%. If there was clear and compelling evidence that continuing to harvest timber in the Willamette National Forest at the current allowable cut of 797 million board feet would jeopardize the future potential supply of timber, an argument could be made for this reduction. There is no such evidence. In fact, in 1980, the Forest Service recommended, and Congress approved, an annual timber harvest of 797 mbf. Since that time, as a result of the recession and legal challenges by preservationist groups, the actual harvest has been less than the forest's potential, further increasing the net growth of the timber resource in the Willamette.

In view of the evidence that current harvest levels are not jeopardizing the future supply, it appears that this proposed reduction is an unwarrented concession to the small, vocal minority that would lock up our forest. I urge you to develop a plan between the draft and final plans which reflects true multiple use of our resource.

Sincerely,

Larry Campbell

LARRY L. CAMPBELL
State Representative
District #43

STATE CAPITOL, SALEM, OREGON 97310-1347
Phones: Salem 378-8772 Eugene 484-2201

CEDRIC L. HAYDEN
EASTERN PORTIONS OF
CLACKAMAS, LANE, LINN,
AND MARION COUNTIES
DISTRICT 38

REPLY TO ADDRESS INDICATED
☐ House of Representatives
Salem, Oregon 97310-1347
☐ PO Box 28
Fall Creek, Oregon 97438

HOUSE OF REPRESENTATIVES
ASSISTANT MINORITY LEADER

005387

May 16, 1988

TESTIMONY OF CEDRIC L. HAYDEN
STATE REPRESENTATIVE DISTRICT 38
CONCERNING THE U.S. FOREST SERVICE
FOREST MANAGEMENT PLAN FOR THE
WILLAMETTE NATIONAL FOREST AND THE
MT HOOD NATIONAL FOREST

I represent a rural legislative district in Oregon. We are 4500 square miles of family farms, mountain homes, and small communities. Almost three-fifths of this district lies within The Mt. Hood and Willamette National Forests. Our mountain communities exist because of their history as logging towns and supply centers. For five generations Oregon families in these small towns have lived within and from the forests. The trees of the Willamette forest built the towns of Oregon's cities, the barns of her farms, and in some cases the earliest roads between them.

In our rural communities are many small mills that depend almost entirely on timber supply from public lands. These mills have been family operations for two and three generations in these forest areas. These are the "family farms" of our forests. They have demonstrated their commitment to on-going economic viability in these towns, and are here for the long term. They are NOT cut and run operations. They do not send basic resources out of the area or out of the country. These mills and the logging families that supply them provide local jobs and long range economic and social stability.

Through the past 150 years, we have changed some uses for our trees, become more efficient in their harvest, and grown to understand the special stewardship each of us has with our forest environment. In the past decade alone, productivity and greater utilization of fiber resources have been remarkable. The timber industry and the citizens of Oregon, particularly this timber dependent area of small communities, have shared a long and beneficial association.

The Proposed Alternative for management of this forest in the decade ahead is flawed in fact and in process. The process from which this proposal is derived relies too heavily on projections based on past management practices, it fails to provide an integration of other national policies and interests, and it has created an unmanageable dichotomy of choice for public respondents setting production against preservation.

If we were somehow able to begin with a blank canvas and design a forest--and a plan for its management--we would certainly allow for the grandeur, the majesty, the hushed beauty so many of us have experienced in the forest on spring days such as this. We might also include some of nature's most interesting creatures, some of its geologic wonders, some of its most dynamic processes. We would design for all the sensory pleasures of the soul to be there. But, we are not beginning with a blank canvas. We have an existing forest, a living, changing resource, and we need to keep in mind this aspect of change--the DYNAMICS of this resource. Our forest is not static and no amount of planning will stop the dynamic processes of our natural world. We must define our management in terms of the forest's own ability to change.

One of the primary difficulties in responding to the development of this management plan is that the proposals tend to create an either/or dichotomy. I do not believe there is a forest worker in Oregon who does not have a strong personal sense of stewardship and reverence for the forest. Just as a farmer knows his livelihood depends on his stewardship of the acres he tills, foresters understand their tie to the trees they harvest and replant. It is no coincidence that one mill in the Santiam Canyon has a dozen father-son employee teams. It is a strong sense of pride in good work and a commitment to future forests which has kept our small towns vital over the years.

The either/or alternatives in developing this plan are unrealistic. Perhaps this dichotomy is its most important flaw. It doesn't allow individuals to truly help prepare the management guidelines, it only allows choices between one grouping of ideas versus another. It is like having only combination plates at a restaurant and no substitutions. There are attractive aspects in most alternatives suggested, but unacceptable elements as well. This means either choosing an alternative knowing part of the choice is unwanted, or choosing not to choose at all. I believe that a better decision-making process would be to separate management areas and allow comment on the extent and conditions of management for each topical area. Then, and this is most important, we must refine each recommendation IN RELATION TO EVERY OTHER NEED in the forests. We have a zero-based forest budget here and every decision impacts every other decision. For that reason, my recommendation is "none of the above" but "some of most of the above." The alternatives as proposed unnecessarily polarize user groups and interested citizens. They

limit the specific recommendations a reviewer may make.

The second greatest flaw in this process is that there is very poor and certainly unclear coordination with other federal priorities and processes. Setting MMRs (Minimum Management Requirements) for particular creatures and species has been accomplished (sometimes without public participation and on data known only to forest gnomes) in separate decisions. Once established, these guidelines become indestructible, non-negotiable legal regulations. And, unfortunately, they are inconsistent. Many are specific and detailed enough to give clear guidance on actual management expectations. Where they give standards for maximum allowable clear cuts, or define the timber available for harvest by dimensional size, or define when contractual obligations are closed on evidence of measurable regrowth, these are useful and practical guides. But, where adopted MMR guidelines are so vague as to require "viable populations of all species" or require the agency to "maintain plant and animal diversity" they are not only useless, but obstacles to making everyday management decisions by public agencies and by private contractors. The potential for rule change or legal challenge is much too great. This is an unmanageable uncertainty for long range business planning.

National policies on energy self sufficiency, on trade goals, on access rights for handicapped, on stabilizing local economies, or on strategic materials have not been sufficiently integrated in this planning process. We must not allow piecemeal management decisions for resources that have broad interties with other federal goals and policies.

The reason I make such a strong case for the human factors in this planning is because we must keep always in mind that we are planning for people here, not salamanders, insects, birds, rocks, fish, or even trees. It is the economic and aesthetic values to humans that is important. The basic question is whether we shall use our forest resources or set them aside as some independent legal entity. While humankind cannot be dissassociated from the natural setting the forests provide to our world environment, there is a great capacity to manage them rationally, carefully, and perpetually for human benefit.

There are errors in the proposals because the process of developing them has made the assumption that the future may be accurately predicted from past and present management experience. But, this is probably not so. Things have and will change. Forest industry practices, Congressional action concerning forest management, and social needs are likely to change markedly in the coming decade, and these plan processes should be forward-thinking to suit the change. For example, federal agencies' costs will probably rise, perhaps dramatically, from

activities like the recent spate of lawsuits and administrative legal delays involving buy-back re-sales.

Clearly, product marketing changes, worldwide timber supplies and demands, further industry productivity improvements, and population bulges demanding increased housing during the coming decade are important changes as well.

The Oregon timber industry is still struggling to recapture momentum lost to the devastating recession of the early 1980s. The industry has responded by making more with less. It has already sharpened its budget axes and altered production practices, improved technology, and trained a stronger work force. In our small towns, this was only possible because the longtime workers in our mills re-trained, they made benefit concessions--they were partners in the very survival of many companies. A reduction of the timber supply now, especially at the drastic levels preferred in this plan will reward their patience, their hard work, and their foresight with lost jobs, a need to leave their homes (and perhaps their families) to find new work, and possibly personal economic ruin. I cannot emphasize enough this HUMAN element because it is the very essence of this public decision. It is as many as 2,000 families in my district alone.

Oregon lumber products are just now becoming competitive in mid-western US markets because of domestic rail deregulations. Oregon lumber products are finding new and expanded markets overseas. Oregon lumber products are again competitive with Canadian producers who dumped subsidized products on the world markets in the past decade. For the proposed plan to recommend harvest levels based on past averages, and not to account for these changes is unrealistic.

In these matters of policy and public planning we must be especially attentive to the human impacts our decisions produce. I speak to this process for the hundreds of loggers, millworkers and local support businesses in my rural district. I also speak for our recreation business industry, and for the individual users of the forests. My voice is to urge true multiple and balanced forest uses and to plea for multiple consideration for all responsible alternative forest users.

I have never met a logger or anyone else who has ever suggested we cut down every tree or foul our streams, or decimate our wildlife. These are real people providing useful and productive products from a renewable resource to the benefit of many. Oregon's timber industry is a responsible neighbor--a major partner in our small towns. The timber supply elements of the proposed alternative fail to provide a stable and adequate materials base for our primary economic partner.

I believe there are significant errors of fact in the documents supporting the Proposed Alternative and the management plan as presented. I do not profess special expertise in analyzing forest economic data but I am convinced that the discrepancies demonstrated in the CH2M HILL review are sufficient to require major re-examination of numerous portions of the proposed alternatives, especially the economic impact premises. While economists seem to have the luxury of ivory towers and hypothetical images of what it means to meet a payroll, our small mills and independent loggers live reality not theory. There must be no "voodoo environomics" in this process. We cannot compare some make-believe dollar value of an insect to a tree or the family it supports.

After reviewing full documents for the Mt Hood National Forest and for the Willamette National Forest, I urge that no change in present management goals for timber supply be implemented. I vigorously oppose reductions in supply which will jeopardize employment and local public revenues in these rural areas without significant economic benefit in return.

I would be pleased to supply any further information I can about the economic and social needs in this rural district. We are communities of "can do" pioneer stock, and we wish to be part of this plan. We wish to have it reflect the real people who are represented in the charts and graphs that accompany public decisions.

Respectfully,

Cedric Hayden

CEDRIC L. HAYDEN
State Representative District 38
Oregon State Legislative Assembly

LIZ VanLEEUWEN
LINN COUNTY
DISTRICT 37

REPLY TO ADDRESS INDICATED:
☐ House of Representatives
Salem, Oregon 97310-1347
☑ 27070 Irish Bend Loop
Halsey, Oregon 97348

Home Phone
369-2544
Capitol Message

017097

HOUSE OF REPRESENTATIVES
SALEM, OREGON
97310-1347

May 13, 1988.

Forest Supervisor, Mike Kerrick
Willamette National Forest
P.O.Box 10607
Eugene, OR 97440

Dear Mike,

I'm attaching a copy of the presentation I made to the Governor's forestry plan task force which I trust you will personally take time to read.

You know as well as I do that the issue is so complicated it's even tough for many of us involved people to sort out what we should say. Working people, especially those with jobs and businesses that require lots of hours don't have time to study out pages and pages of material --- so please don't minimize the importance of the form letters you receive.

People do know that community stability and continuing jobs are real essential to them. I firmly believe that with proper management we can achieve a sustained yield. I am a supporter of the Willamette Forestry Council's alternative plan.

For your information I'm attaching a piece of material sent to many of my constituents who are greatly impacted, one way of the other, by the end decision on the Willamette National Forest Plan.

You have forced me into spending quite a bit of time on this issue.

Sincerely,

Liz VanLeeuwen

Liz VanLeeuwen, State Representative, District 37.

LVL/dd

HOUSE OF REPRESENTATIVES
SALEM, OREGON
97310-1347

2/9/88

To: Norm Johnson, Coordinator, Governor's Federal Forestry Plan Task Force

Re: Willamette National Forest and Linn County

Dear Norm:

The future of Linn County and its citizens is dependent upon the management plan adopted by The Forest Service for The Willamette National Forest. Community stability and Linn County jobs must play a major role in deciding how our forest should be managed.

465,613 acres of the Willamette National Forest lie within Linn County.

105,840 acres--nearly 1/4 -- of this forest in Linn County is already permanently preserved and closed to multiple use!

If the Forest Service's preferred alternative is selected as a management plan, additional forest in Linn County will be set-aside for single use and no harvest. Additional set-asides will result in less revenues to Linn County for schools and roads, and fewer jobs.
If the harvest level on The Willamette National Forest is reduced by 150 million board feet per year as suggested by the Forest Service, the result will likely be a loss of 1000 industry jobs and 2000 associated jobs. Many of these lost jobs would be in Linn County. Recovery would not be possible because the timber supply will be permanently reduced.

We must not allow this to happen! The forest has, and can, provide a harvest level necessary to promote community stability and still address all the other concerns of the forest. Wildlife habitat can be maintained without setting aside an additional 27,000 acres (42 square miles) in Linn County for single use forest wildlife habitat.

The forest has been managed very well under the present multiple-use forest management. There is NO reason to change from what has worked so well.

I might add that I have real problems with The Forest Service's Preferred Alternative J as they compare it to the past 10 year average for jobs and timber harvest. That average includes the early 80's when the timber industry was experiencing its WORST DEPRESSION in history! We are only now recovering. The forest plan should be commpared to the forest resource output we experienced in 1987, not those other years.

Sincerely,

Liz VanLeeuwen, State Representative Dst. 37

LARGE MATURE AND OLD GROWTH TREES IN LINN COUNTY
(ACRES BY LAND ALLOCATION)

LAND ALLOCATION	LARGE MATURE/OG	OTHER	TOTAL
NO HARVEST AREAS:			
WILDERNESS	41,487	59,447	100,934
H.J. ANDREWS	1,450	811	2,261
RESEARCH NATURAL AREAS	704	299	1,003
ADMINISTRATIVE SITES	149	1,493	1,642
MINIMUM MGT. REQUIREMENTS:			
SPOTTED OWLS	18,962	0	18,962
PILEATED WOODPECKER	2,154	85	2,239
PINE MARTEN	5,333	0	5,333
BALD EAGLE	128	0	128
OPTIMUM THERMAL COVER	896	0	896
UNSUITED SOILS	18,109	19,453	37,562
NON-FOREST	0	17,235	17,235
HARVEST AREAS:			
RIPARIAN	7,295	7,060	14,355
TIMBER MANAGEMENT	116,057	147,006	263,063
TOTAL	212,724	252,889	465,613

The above figures were supplied to Rep. Liz VanLeeuwen on 2/5/88 by James Mayo, Timber Planner for the Willamette National Forest, 211 East 7th Ave, PO Box 10607, Eugene 97440. (Phone 687-6915)

OREGON STATE SENATE
STATE CAPITOL
SALEM 97310-1347

SENATOR C.T. (CUB) HOUCK
SENATE REPUBLICAN LEADER
(503) 378-8178

014668

May 13, 1988

Mr. Mike Kerrick, Forest Supervisor
Willamette National Forest
PO Box 10607
Eugene, OR 97440

Dear Mr. Kerrick,

As Republican Leader of the Oregon State Senate, and as a private citizen concerned about the economic future of this state, I would like to offer the following comments on the draft Willamette National Forest Plan.

Oregon's forest land has historically provided the sustenance for Oregon's economy. In my view, there is no question that our forest land is biologically capable of continuing to be the primary source of jobs, prosperity and economic stability for many generations of Oregonians to come. Since the majority of our forest land is owned by the federal government, however, the question of whether that land will in fact continue to serve as the foundation of our economy is largely dependent on public policy decisions made by the responsible federal land management agencies.

On that key point, I find the preferred alternative in the draft Willamette National Forest plan to be troubling. It would authorize an annual "allowable sale quantity" of 568 million board feet, 21 per cent lower than the 1987 harvest level.

It appears that the main reason for this severe reduction is that, if the preferred alternative is adopted, 49 per cent of the Willamette National Forest would be off limits to timber production under the new plan.

It is impossible to lock up that much land and at the same time be able to adequately provide for the needs of timber-dependent communities. It is also hard to conceive that these kinds of massive set asides were intended by Congress in 1976. Such a result would also seriously distort the historic policy of Congress and the federal government of sustained yield management. If the total amount of land available for timber production is drastically reduced to the extent contemplated in the preferred alternative, the most conscientious application of sustained yield management techniques imaginable will still not be sufficient to provide the wood fibre output needed to keep Oregon's economy on a solid footing.

It is my sincere hope that the final management plan for the Willamette National Forest will more adequately reflect the key role of the National Forests in the economic future of this state. Thank you for considering my comments on this critically important issue.

Sincerely

Senator Cub Houck
Senate Republican Leader

CTH/tc

BOB KINTIGH
DISTRICT 14
REPLY TO ADDRESS INDICATED:
☐ Senate Chamber
Salem, Oregon 97310-1347
☒ 38865 E Cedar Flat Road
Springfield, Oregon 97478

014175

OREGON STATE SENATE
SALEM, OREGON
97310-1347

May 13, 1988

Forest Supervisor Mike Kerrick
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mike,

As an Oregon citizen, professional forester with 40 years experience and a State Senator I cannot support your recommended management alternative for the Willamette National Forest. The primary reason is that such a small percentage is to be retained for general multiple use.

By its very name multiple use means that the land is available for many uses not just timber production. Multiple use land can provide wildlife, fish and many forms of recreation as well as high quality water under proper management techniques. I believe you and your staff are technically competent to do such a job.

Therefore, it is not reasonable in addition to the present 23% set aside for wilderness to set aside an additional 26% in "Special Uses" plus 19% in Restricted Multiple use. I feel a more reasonable allocation would be to designate approximately 60% of the Forest for multiple use management with restrictions on maybe one tenth of that part. This would still leave 40% for wilderness and special set asides.

The 1984 Oregon Wilderness Act stipulated that the unroaded areas not included in Wilderness be managed for wildlife use. Why aren't you going to do it?

I expressed confidence above in your professional management ability but you do disappoint me in one area. You have designated a large number of acres unsuitable for timber production because of the perceived reforestation problems. With the great amount of research that has been done in this area I feel there is know how to reforest almost any land on the Willamette. If trees grew there before they will grow there again.

In regards to recreation, I feel that rather than more wilderness there is a real need for dispersed family type recreation. There needs to be places where individuals and families can go who have only a limited amount of time or are not physically able to take a wilderness trek. Low elevations should be favored so that they can be used for a longer season and possibly all year around. How about some provisions for seniors and handicapped people?

I believe too much emphasis is placed on visual management. I doubt that 5% of the people can tell an old growth from a second growth tree. For some time I have been trying to obtain evidence that tourists stay home because of clear cuts along a highway but have found none. Having grown up in the East I know that people there recreate in and enjoy viewing second growth forests because that is the only kind there. The Great Smokey Mountains National Park and the eastern "wilderness" were all logged at one time. The lower McKenzie Valley where I live is all second growth is considered scenic and there are many other similiar valleys in Oregon. As foresters we need to be extolling the beauty of a young vigorous forest instead of hiding our activities behind the ridge. If we must hide our activities I have some ideas of better ways to do it than leaving a strip of old growth along a road to blow down which I would be glad to discuss with you sometime.

With the hundreds of comments you are no doubt receiving you probably don't need a longer letter from me. In closing I'll just say again, put more land in the Multiple use category and then do a good job of managing with emphasis on the "Multiple."

Sincerely,

Bob Kintigh

MAE YIH
LINN AND BENTON COUNTIES
DISTRICT 19

REPLY TO ADDRESS INDICATED:
S 214 - State Capitol
Salem, Oregon 97310-1347
Phone (503) 378-8847

34485 Yth Lane NE
Albany, Oregon 97321
Phone (503) 327-2666

COMMITTEES
Member:
Ways and Means
Government Oper
Human Resources

OREGON STATE SENATE
SALEM, OREGON
97310-1347

014879

May 9, 1988

Michael A. Kerrick
Forest Supervisor
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick,

I am the State Senator representing Oregonians in Linn and portion of Benton counties. The Oregonians I represent will be greatly effected by the final management plan adopted for the Willamette National Forest. The livelihood and way of life of all Oregonians is at stake. It is for this reason that I have been involved in the analysis of your Draft Environmental Impact Statement for the Willamette National Forest. I offer these comments for consideration in formulating your final plan for forest management.

Management decisions must be based on accurate data and scientific facts. Analysis of your draft plan has revealed many technical errors and assumptions based on conjecture and not facts. This is not acceptable considering the potential impact to the citizens of Oregon and Oregon's economy. The Forest Inventory, Empirical and Managed Yield Tables, Land Suitability Classifications, and Economic Assumptions must all be corrected to represent actual conditions on the forest. It is inconceivable that final forest plans be adopted without correcting these basic data deficiencies.

It is apparent through the plan analysis that the stability of communities dependent upon the Willamette National Forest was not a major consideration when formulating land allocations for the forest. In fact, it appears in most cases that it was not a consideration at all. Managing for timber production as a forest use was not given equal status with other forest uses. Only after other predetermined forest uses were fully met was consideration of timber harvest made. There was no chance for economic and social trade offs to be considered. This is a basic flaw in your planning effort. The economic and social needs of a community's citizenry dependent upon the Willamette National Forest deserves at least equal status with other forest uses.

I strongly urge that such emphasis be put into your final management plan. The Organic Administration Act of 1897, which grandfathers all forest planning, specifically addresses the needs of timber dependent communities.

> "No public forest reservation shall be established except to improve and protect the favorable conditions of water flows, and to furnish continuous supply of timber for the use and necessities of citizens of the United States"

No legislation has ever withdrawn these primary purposes of National Forests.

I feel very strongly that too much emphasis was put on Single-Use land allocations like Roadless Areas, Old Growth Preserves, and Wildlife Habitat Areas in your draft plan. More emphasis should be put on Multiple-Use Management of the forest. You should recognize that timber harvest is compatible with other forest uses.

In conclusion, I am not pleased with the direction the Forest Service has taken to date in their planning for the Willamette National Forest. I do, however, realize that I am talking about a draft plan. I will be greatly disappointed if the final plan resembles the draft Alternative J as proposed by the Forest Service. There is no doubt that the Willamette National Forest can continue selling timber at current levels (1987 net sell level 717MMbf - 1988 net sell target 710MMbf) while protecting and providing other uses of the forest. I recommend that you continue managing the Willamette National Forest in a manner that will benefit the citizens of Oregon. This cannot be done if you reduce the sell and harvest levels of the forest.

Sincerely,

Mae Yih
State Senator

MY:krm

Executive Department

155 COTTAGE STREET NE, SALEM, OREGON 97310

May 19, 1988

TO: Interested Citizens

FROM: K. Norman Johnson, Federal Plans Coordinator

SUBJECT: STATE OF OREGON'S COORDINATED RESPONSE TO THE WILLAMETTE NATIONAL FOREST PLAN

Enclosed you will find the State of Oregon's coordinated response to the Willamette National Forest Draft Environmental Impact Statement and Proposed Land Resource Management Plan. This response was submitted to the forest supervisor on May 16, 1988.

The primary objective of this coordinated response is to identify technical problems with the planning documents rather than to recommend an alternative. Further indepth analysis of the data and discussion with the Willamette National Forest staff are necessary before the State can recommend an alternative.

Additional copies of the coordinated response and detailed agencies comments can be obtained from the following locations:

State Department of Forestry
3150 Main Street
Springfield, OR 97478

State Department of Forestry
4690 Highway 20
Sweet Home, OR 97386

State Department of Forestry
22965 N. Fork Road, SE
Lyons, OR 97358

Oregon Department of Fish and Wildlife
506 SW Mill Street
P.O. Box 59
Portland, OR 97207

State Department of Forestry
2600 State Street
Salem, OR 97310

Oregon State University
College of Forestry
Forest Management, Peavy 202
Corvallis, OR 97331

KNJ:rjl
Attachment

NEIL GOLDSCHMIDT
GOVERNOR

OFFICE OF THE GOVERNOR
STATE CAPITOL
SALEM, OREGON 97310-1347

May 16, 1988

Michael A. Kerrick
Forest Supervisor
Willamette National Forest
P. O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

Active participation in federal forest planning is a high priority for all Oregonians. It is essential that the hopes, needs and ideals of Oregonians be incorporated into these important resource plans. The plans must be environmentally sound and provide stable, predictable supplies of commodities and amenities. In that context, this letter provides the State of Oregon's comments on the Willamette National Forest Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan (LRMP).

The state depends upon the Willamette National Forest for resources critical to Oregon's economy and environment. These lands provide a significant share of the employment in Lane, Linn, and Marion Counties through their impact on the timber, recreation, fishing, and agricultural industries. These counties also derive much of their revenue from use of Forest resources. In addition, the Forest contains critical watersheds and big game habitat, anadromous fish streams, spectacular wilderness areas, majestic stands of old growth timber, the Detroit Reservoir and Waldo Lake recreation areas, and the scenic Santiam, McKenzie and Willamette River corridors.

The State's objectives for management of the Willamette National Forest are twofold. First, these lands should be managed in an environmentally sound manner so that future generations have the same opportunities we do to enjoy the bounty the lands can provide. Second, these lands should produce the a high-level and sustainable flow of economic benefits and amenities. Our comments here focus on evaluating your resource management planning from these perspectives.

Thirteen State agencies have reviewed the DEIS and LRMP. In addition, we held public meetings in Lebanon and Eugene to hear what issues relative to the proposed Plan were of special interest to the public. This letter and the detailed agency comments which are attached highlight the State of Oregon's questions, concerns, and recommendations on these documents. Please consider them in development of your Final Environmental Statement (FEIS).

THE STATE RESPONSE

We recognize the tremendous effort that went into constructing the DEIS and LRMP and we appreciate your staff's help to us as we reviewed these documents over the last few months. Your staff should be commended for the depth of analysis and detail of presentation in your DEIS and LRMP. Nonetheless, the State of Oregon cannot support any of the alternatives in the DEIS because the planning documents do not provide all of the information we believe is needed to make a reasoned decision. We also believe that your analysis is faulty in not recognizing the geographic detail needed to assess the environmental implications of the proposed plan.

With your help, we intend to construct our own State alternative for the Forest. We had hoped to do this during the comment period, but our difficulties with your analysis and the existing data gaps prevent us from constructing that alternative now. We still plan to construct a State alternative. We view this letter as a vehicle to help you understand our difficulties with your analysis and the additional data about your Forest that we need.

The rest of this letter highlights our major information needs. In outlining our problems, we want to emphasize that we wish to work with you in a cooperative manner to solve them. Both the Federal Plans Coordinator and the agency contacts mentioned on the attached list are willing to discuss these comments further and meet with you to explain our suggestions for clarification and improvement, and to clear up any misunderstandings that we may have. The Federal Plans Coordinator and key state agency heads will also visit and tour the Forest to help me understand the issues involved.

Our comments on your Plan are organized into four main sections: A) development of alternatives, B) estimation of resource effects, C) estimation of economic effects, and D) other considerations. Our principal concerns with the DEIS and the LRMP relate to your timber management proposals, treatment of watershed and visual quality issues, and your evaluation of recreation demands and opportunities.

The proposed plan would reduce your annual timber offerings by about eleven percent from historic levels, and reduce your maximum allowable sales level by about 29 percent. Such reductions have major impacts on Oregon's economy and must be fully justified. We believe that potential deficiencies in your timberland suitability determinations, your timber inventory and yield projections, and your consideration of management intensification opportunities may heighten resource conflicts and unnecessarily reduce timber harvest levels.

Water is a critically important resource on the Willamette National Forest, yet you project that your proposed plan could cause significant deterioration in some Forest watersheds. While the discussion of watershed impacts is comprehensive, we believe that your planning analysis should be rebuilt by recognizing watersheds as the basic building block. Doing so should enable you to adjust your activities to avoid significant watershed deterioration, and do so at least cost to other Forest outputs such as timber.

Our tourism industry is largely based on outdoor recreation. Without high quality recreation opportunities the potential for tourism development is uncertain. We believe more analysis is needed on your provision of trails, scenic drives, and developed recreation facilities.

A. Development of Alternatives

We are concerned that the alternatives you developed may be unduly restrictive and may overemphasize the conflicts among commodities, amenities and environmental effects more than need be. We believe a wider range of choices should be examined, or else you should explain more completely why this wider range would not improve the results. Toward that end, we focus in this section on six key outputs and effects from the Forest: 1) timber production; 2) streamflow and watersheds; 3) the fishery; 4) big game; 5) visual quality; and 6) recreation opportunity and facilities. In addition, we discuss the need for coordination of your proposed plan with plans of affected communities and with the Oregon Natural Heritage Plan.

1. Timber Production

The wood products industry forms the backbone of manufacturing employment in Lane, Linn, and Marion counties. In addition, timber receipts from Forest Service and Bureau of Land Management forests make critical contributions to sound school and road programs. Understanding the significance of your proposed timber sales level requires that the public be able to relate your current proposal to your past timber harvest levels. To help us (and the public) gain this understanding, we developed the following table showing past and proposed timber outputs:

		Type of Timber Output (MMBF/year)			
		ASQ	Other Sawtimber	Other Timber	Total
1.	The Existing Timber Resource Plan (1977)				
	Potential Yield	797	53	146*	996
	Programmed Harvest	641	31	121*	793
2.	Average volume Sold				
	1977-1986	627	26	131	784
	1985-1987	669	30	133	832
3.	Average Volume Harvested				
	1977-1986	486	20	101	607
	1985-1987	649	27	135	811
4.	Preferred Alternative (J)	568	23	119	710

MMBF/year--million board feet per year
ASQ--allowable sale quantity
*Not in the Timber Resource Plan but estimated here to allow comparison.

This table represents four quantities:

1) ASQ--the allowable sale quantity--the sawtimber from regular timber sales on land suitable for timber production. It almost exclusively comes from live, sound trees and its estimate is a major focus of the forest planning analysis.

2) Other sawtimber--sawtimber from salvage sales, other dead sawtimber from regular timber sales not counted in the allowable sale quantity, and the estimated sawtimber sales that will occur on land designated "unsuitable" for timber production.

3) Other timber--timber that is submerchantable due to small size or because it is not sound. Here it consists largely of "cull" volume that is incidental to regular timber sales--volume that does not meet Forest utilization standards because too small a proportion of it is sound (not rotten).

4) Total--the sum of allowable sale quantity, other sawtimber, and other timber--now called "timber sale program quantity" by the Forest Service.

These terms need to be carefully defined and used, as you know.

The existing Timber Resource Plan has guided timber sales on the Forest since 1977. It is represented here by two quantities: 1) potential yield and 2) programmed harvest. Potential yield is the ceiling on the amount of sawtimber volume (ASQ plus other sawtimber) that can be offered under the 1977 plan. Programmed harvest states the target for sawtimber volume under the 1977 plan, considering likely budgets and an estimated yield from lands marginal for timber production. It can be less than or equal to potential yield. Here the programmed harvest is 156 million board feet less than potential yield in terms of ASQ, and 178 million board feet less in terms of ASQ plus other sawtimber. The programmed harvest provided the basis for the actual quantities offered and sold during the 1977 plan period.

We concentrate our discussion below on the ASQ because this output produces most of the employment, income and county revenues from timber production. Here, the ASQ portion of the programmed harvest in your existing Timber Resource Plan is 641 million board feet and the average annual ASQ volume actually sold during the period 1977-1986 was 627 million board feet. Thus sales achieved 98 percent of their target.

Timber sales set an upper limit on timber harvest, and timber buyers have a number of years to harvest the timber after purchase. Thus the harvest tends to fluctuate with market conditions and purchaser raw material needs. Looking at the 10 years reported in your DEIS (1977-86), average ASQ harvest (486) fell well short of average ASQ sales (627) as the deep recession of the early 1980's made it difficult for timber buyers to harvest profitably the timber they had purchased. Looking at the last three years, though, ASQ harvest (649) was much higher as good lumber and plywood markets returned, with the 1987 harvest of approximately 720 million board feet (including some contract default volume) being the highest harvest in recent memory. In a period long enough to include the ups and downs of wood products markets, harvests and sales should come into balance.

The preferred alternative in your forest plan proposes an ASQ of 568 million board feet/year and a total harvest of 710 million. This proposed sale level merges the features of potential yield and programmed harvest. It is both an upper limit and a target. Thus 568 million feet is both the intended sale quantity and the maximum sale quantity for the ASQ portion of total timber output.

If our analysis of these data and your definition is correct, we can reach some important conclusions. First, comparing your proposed ASQ (568) to the ASQ portion of the programmed harvest (641) in your 1977 Timber Resource Plan, it appears that you intend to offer for sale approximately 73 million board feet (11 percent) less volume than you offered in the past. Since you were generally successful in selling your programmed harvest in the past, we count on you to have the same success in the future. Therefore, we conclude that the proposed ASQ in your preferred alternative would provide somewhat (11 percent) less opportunity to contribute to the economic health of timber-dependent communities than did your existing plan. The actual contribution that will be made, of course, depends in part on the level and cycle of demand for wood products and the productivity and efficiency of the wood products industry. Over the last years, the productivity of our mills has increased dramatically. In 1979, it took 4.5 sawmill workers to produce one million board feet of lumber; by 1986 it took 2.8 workers.

Comparing your proposed ASQ (568) to the ASQ portion of the potential yield (797) in your 1977 Timber Resource Plan, it appears that the maximum sale level will decrease by 229 million board feet (29 percent). Therefore, we must conclude that your ability to make a relatively increasing economic contribution to the economic health of timber-dependent communities (which previously could have happened as you moved toward achieving potential yield) will no longer exist if your preferred alternative is implemented.

Based on our understanding of the concepts discussed above, we outline below the additional timber management information we need to enable us to understand the merits of your proposed plan, and suggestions we have for increasing the compatibility and efficiency of timber production on your Forest. This discussion is divided into three parts: a) timberland suitability, b) timber inventory and yields, and c) timber management intensification.

a. Timberland Suitability

From the standpoint of timber production, no decision is more important than your determination of the land base on which you will regularly schedule timber harvest. Your LRMP points out that your preferred alternative has 858,170 acres suitable and available for timber production out of a total forested area of 1,507,225 acres and a total national forest acreage of 1,675,407 acres. You give the reasons for reduction in this timberland base as follows:

I.	Forested lands		1,507,225
II.	Forested lands unsuitable for timber production		501,791
	A. Withdrawn from scheduled harvest	327,525	
	1. Wilderness	305,915	
	2. Research Natural Areas (established)	1,450	
	3. Oregon Cascades Rec Area	5,695	
	4. H. J. Andrews Exp. Forest	14,505	
	B. Risk of irreversible resource damage	42,705	
	C. Regeneration difficulty (5+ years)	131,561	
III.	Forested lands tentatively suitable		1,005,394
IV.	Additional forested lands unavailable		147,224
	A. Meeting minimum management requirements precludes timber harvest	53,255	
	1. Spotted owl habitat	42,634	
	2. Pileated woodpecker habitat	3,144	
	3. Pine marten habitat	6,500	
	4. T and E species--bald eagle	977	
	B. Meeting multiple-use objectives precludes timber harvest	93,969	
	1. Research Natural Areas (proposed)	3,029	
	2. Special interest areas	15,251	
	3. Old growth groves	3,925	
	4. Special wildlife habitats	11,348	
	5. Dispersed rec areas	52,386	
	6. Developed rec areas	2,931	
	7. Elk/deer thermal habitat	4,971	
	8. Mining claims	128	
V.	Forested land suited and available for scheduled timber harvest		858,170
VI.	Total forested land unsuited (II A+B+C) and unavailable (IV A+B)		649,055

In total, your preferred alternative has 57 percent of your forested land suitable and available for scheduled timber harvest.

Your definition of the lands suitable for timber production could both reduce the timber output possible from your forest and heighten resource conflicts on the lands that are suitable for both timber and other uses. The DEIS points out two major reasons for these reductions, beyond those lands statutorily withdrawn from scheduled timber harvest (II A) or withdrawn to achieve other resource management objectives (III A&B): 1) lands that have the risk of irreversible resource damage (II B-42,705 acres); and 2) lands where you are not sure that reforestation can be achieved in five years (II C-131,561 acres).

The large acreage declared unsuitable due to regeneration difficulty (11 percent of your forestland outside of Wilderness) especially concerns us. We do not understand why you should have difficulty regenerating lands on your Forest, except perhaps the high elevation Mountain Hemlock. Looking at your suitability maps we were surprised to see that most of these difficult-to-regenerate lands lie among your low elevation Douglas-fir/hemlock types.

We did not find in your DEIS an explanation of how these timberland suitability designations were made. Were they site-specific or based on general land and soil typing? In addition, we could not find evidence that your analysis looked beyond the problems encountered with past practices in assessing potential for reforestation success. We believe that the forest industry is now able to regenerate most of its lower elevation lands similar to yours. We urge you to reevaluate your lands declared unsuitable due to regeneration difficulty, incorporating the latest research results and successes on similar sites held by other owners.

We are also interested in better understanding how you determined that 42,705 acres were unsuitable due to risk of irreversible resource damage and other high-risk soil loss acres were suitable for timber production.

b. Timber Inventory and Yield

The starting timber inventory and the yield projections for existing and future stands form the basis of any estimate of the sustainable timber harvest level. We had significant difficulty understanding how your modeling assumptions affected these key components. Specifically, we would like to know: 1) how the acres and volume by age class represented in your forest planning analysis for potentially suitable timberland relates to the results from your last timber inventory; 2) how the growth projected on your existing stands in your planning analysis relates to the growth found on the suitable acres in your last timber inventory; and 3) the rationale for any differences uncovered between assumed and actual inventory and growth.

Assuming that your Record of Decision is approved next year, your plan will begin in 1989, and the midpoint of the first decade of its applicability will be 1994. Therefore, your inventory should account for acres harvested through 1988. Because your forest planning analysis looks at timber scheduling a decade at a time and assumes that actions take place at the decade's midpoint, you should update forest growth to 1994. Your planning documents seem to use 1990 as the midpoint of the first decade.

For representation in your forest planning analysis, your timber inventory has been condensed into only a few categories that aggregate over age, site, and stocking level. Age classes represented in the 857,000 acres that allow regularly scheduled timber harvest in the preferred alternative are:

Age	10	20	30	40	50	60	70	80	90	100	110	120	130
Acres (1000)	79	165			23	41						112	

Age	140	150	160	170	180	190	200	210	220+	Total
Acres (1000)	11		13					42	372	858

You show no stands aged 30-40, 70-110, 130, 150, and 170-200. Such an approach can increase resource conflicts and reduce timber outputs in a number of ways. First, the approach can erroneously make it appear that diversity of wildlife habitat of certain key ages has been greatly reduced. Second, the approach increases the unevenness of the inventory which can accentuate the problem of the availability of immature stands needed to meet the nondeclining yield requirement in future decades.

Third, this approach can result in overlooking intensification opportunities in existing stands. Your analysis shows little commercial thinning opportunity in the first few decades, and you note that reduced timber harvest volume from thinning is, in fact, one of the major reasons for the difference between the No Change alternative and the preferred alternative. With only 64,000 acres shown in the prime thinning ages, between 40 and 110 years, those results are not surprising. But do they reflect your forest or are they an artifact of your data aggregation? When dispersion constraints control the amount of clearcutting, commercial thinning can be an important tool for increasing wood harvest. You should reexamine your aggregation across ages, sites, and stocking levels to ensure that it has not caused the problems discussed here.

Fourth, lumping all acres over 220 years into one age class makes it difficult to grasp how much acreage your forest has in the very old stands for which the Willamette is justifiably famous (400-800 years of age). These stands are sought by a variety of users for their superlative qualities and should be more clearly identified.

You use an unpublished and hard-to-understand growth model for your existing timber stands beyond the sapling stage. Please explain and justify this empirical yield model in your FEIS. In addition, we urge you to reevaluate its appropriateness for your Forest. With your Forest inventory now in a deficit condition (more discussion below), accurate projection of growth on your existing stands becomes a crucial ingredient in determining your starting harvest level under nondeclining yield. Please see the comments of Oregon State Department of Forestry (OSDF) for detailed suggestions.

c. Management Intensification

The harvest schedule for the Willamette National Forest displays the characteristics of a "deficit timber inventory" in which the nondeclining yield harvest level starts below the long run sustained yield of the forest. Moving that starting harvest level toward long run sustained yield requires either increased growth on existing merchantable timber stands or earlier availability of young stands that now exist or that will be created when the existing timber is harvested. According to your forest planning analysis, growth will begin to exceed the starting nondeclining yield harvest level by the sixth decade, but the harvest level does not increase until the 15th decade because of restrictions in your analysis. Making it possible to take advantage of that increased growth in decades 6-14 could ripple all the way back to the starting harvest level.

One way to provide that earlier availability would be to allow shorter rotations on the second growth timber than allowed in your proposed plan. You now require that even-aged stands must "generally have reached" culmination of mean annual increment before final harvest can be considered. Applying these shorter rotations to a portion of your Forest could enable a higher starting nondeclining yield level or produce the proposed harvest level on a smaller land base, thus reducing possible conflicts with other land uses. Please further examine the implications of such an approach and see the comments of the OSDF for more discussion.

Forest fertilization is another approach to providing more volume earlier that merits close examination. It is especially important in your harvest schedule because it shortens time to reach 95 percent of culmination (and therefore rotation age) by 10 years. You currently allow fertilization to be considered in your forest planning analysis for the 30 percent of your Douglas-fir/hemlock type (22 percent of your suitable timberland) whose soil types have demonstrated a response. We have a number of questions here. At what rate will you finish testing your soils? Do you have a procedure set up to incorporate these results as they occur, or will they have to await some other triggering event for inclusion? The Umpqua National Forest, with whom you share a long common border, assumes that all of its Douglas-fir/hemlock type will respond to fertilization. Are they ahead of you in their soil testing or are they using a different criterion to judge the merits of this intensification measure?

2. Stream Flow and Watersheds

No output from the Willamette National Forest is more valuable than the water you produce. Municipal, recreational, and fish and wildlife demands ensure that this water is used over and over again as it flows to the sea. While you have no formal municipal watershed agreements, you provide the principal source of drinking water for over 200,000 people in the Willamette Valley and surrounding area, including over 70 percent of the water used in Eugene and Salem. Water provides the focus for much of the recreational use of your Forest, whether it is a water skier carving a wake on Detroit Reservoir, a canoeist gliding across the pure waters of Clear Lake, or a fly fisherman casting her line onto the rolling McKenzie River. The salmon and steelhead fishery in the major rivers of the Forest (discussed in the next section) make an important contribution to the downstream sport and commercial catch.

You have done an outstanding job of portraying the implications for your proposed plan on water quality, peak flows, and the health of your watersheds. In fact, you have revealed more information about these implications than has any other Forest we have reviewed. What you report is very disturbing indeed. You state that your plan will increase erosion rates and further accentuate the peaks and valleys of your water flow on many of your 26 watersheds leaving the more sensitive of them as probable candidates for significant deterioration. Assuming that this analysis stands up to professional scrutiny, you need to work on improving this aspect of your proposed plan more than any other.

We have outlined your conclusions below, to enable you to assess our understanding. We have also made a number of suggestions for improvement. Fundamentally, though, we believe that your forest planning analysis, as currently structured, is inadequate to support the conclusions you make and the analysis you need to do. We recommend that you recast your analysis to reflect the importance of your forest watersheds by recognizing them as basic building blocks in your forest plan.

We divide our discussion on the effects of the proposed plan on stream flow and watersheds into three parts: 1) effects on sediment production; 2) effects on peak flows; and 3) cumulative watershed effects.

Fundamental to your analysis of these effects is the development of a "watershed sensitivity index" that describes a watershed's inherent susceptibility to disturbance and the likelihood of that disturbance resulting in an effect on sediment or streamflow which is transmitted to and through the stream system. Four parameters are used in this index: natural soil erosion rate, perennial stream density, peak discharge, and watershed area below 4,000 feet. Higher rates or amounts of each parameter indicate greater watershed sensitivity. Considering these four factors, you then construct an overall index of sensitivity, and based on that index put each watershed into a high, medium, or low sensitivity group.

a. Sediment Production

You state that you measure potential sediment yield by combining estimated soil erosion with the watershed sensitivity index. Soil erosion, in turn, is keyed to natural erosion rates and the amount of activities planned in each watershed. According to your estimate, Alternative F most closely approximates the actual level of activity during the last 10 years. In comparison to that alternative, you project that your proposed plan will increase erosion rates in 75 percent of your watersheds and decrease it in 25 percent in the first decade. Over time, according to your estimates, erosion will diminish under all alternatives as the effects of past unsatisfactory roadbuilding and logging practices dissipate.

What model are you using to estimate erosion rates? We could find no reference to it in your planning documents. Also, you do not show sediment production in total or by watershed, but wait until the cumulative effects analysis to integrate soil erosion with watershed sensitivity.

b. Peak Flows

Peak flows are important in any assessment of watershed impacts of an alternative because of their potential for damage to stream channels, riparian areas, and forest facilities such as bridges and roads. Especially when combined with large amounts of sediment and landslides, increases in peak flows can cause significant damage. You state that these increased flows are largely a function of compaction of large areas of soil and increase in the volume of snow accumulation in the transient snow zone (below 4000 feet). You further state that increasing the impact of rain-on-snow events is the principal cause of larger peak flows on this Forest.

To minimize the chance of increased peak flow and landslide incidence, the Forest developed a risk assessment tool called "hydrologic recovery" which our Water Resources Department (WRD) suggests you might more descriptively call "hydrologic stability." This tool enables you to assess hydrologic recovery (stability) based on watershed sensitivity (described above) and percentage of watershed disturbance in the last few decades. You construct a hydrologic recovery percent from amount of disturbance for each watershed under each alternative and then assess whether a watershed has gone beyond a "threshold of concern" relative to increased peak flow. This threshold is a function of the watershed's calculated sensitivity.

Based on these calculations, you conclude that 12 of your 26 watersheds are at high risk of experiencing increased peak streamflow and landslide incidences under your propsed plan--four more than under Alternative F which represents, in your eyes, the actions and output levels of the last 10 years. Included in these 12 are such important streams as the Breitenbush River, Fall Creek, and the North Fork of the Middle Fork of the Willamette.

c. Cumulative Watershed Effects

You base your cumulative effects assessment on a risk analysis which compares watershed sensitivity to watershed condition under each alternative, with each watershed assigned a risk rating of "Probable," "Possible," or "Unlikely." A "Probable" rating, as an example, indicates a high risk of cumulative downstream effects on water quality, physical stream characteristics and fish habitat as a result of the activities planned under the alternatives. To receive a "Probable" rating, a watershed must be anticipated to experience high rates of erosion and low hydrologic recovery.

Your preferred Alternative J has 11 watersheds in this "Probable" risk category--five more than Alternative F. Thirty percent of the Forest falls in these watersheds including the parts of the Breitenbush, Santiam, Fall Creek, and various forks of the Willamette. Thus one third of the Forest's watershed area is vulnerable to management-induced declines under your proposed plan--a disturbing result.

d. Conclusions

These results cause us great concern. Consciously planning to put key watersheds at risk seems inconsistent with the mandate you have for protecting the resources under your control on a publicly owned Forest. You must make every effort to redistribute the activities to lessen these risks. As an example, you should present the benefits and costs of constraining your forest planning analysis to require that none of your watersheds fall into the "Probable" category, and then that none fall into the "Probable" or "Possible" categories. In addition, you need to demonstrate these results over a number of decades into the future to insure that unacceptable cumulative effects are not building over time. Unfortunately, your forest planning analysis is not easily amenable to this kind of critically needed assessment. Because you do not recognize your watersheds as building blocks in your forest planning analysis, you cannot easily model controls on the rate of activities that occur in them nor do this modeling with any assurance that you are finding solutions to these difficulties that minimize the impact on other outputs such as timber harvest.

Forests around you such as the Siskiyou, Rogue River, Umpqua and Mt. Hood have constructed forest planning analyses that allow them to recognizes 25 watersheds or locator areas in their analysis and to control the activities that occur in them over time. You might consider these formulations as you revise your analysis.

3. The Fishery

The spring chinook and summer steelhead fishery on the your McKenzie, Santiam, and Willamette Rivers provide 80 percent of the spring chinook catch on the lower Willamette, a significant portion of the catch by commercial gillnetters on the Columbia and a growing source of steelhead. Your resident fishery, primarily cutthroat and rainbow trout, contribute greatly to recreational experiences on your Forest. Maintaining and enhancing these resources should be a major focus of your Forest plan.

As you point out, the fishery on the Willamette National Forest has deteriorated over time due to construction of reservoirs, past roadbuilding and logging practices near streams, and the severe 1964 storm that degraded habitat in several streams. Now and in the future, you expect to reverse these trends by eliminating barriers to fish movement, improving roadbuilding and logging practices, improving riparian protection and increasing instream investment.

In the DEIS, you state that the key factors in anadromous fish habitat capability are water temperature, spawning gravel, food, and living space. You state that three major man-controlled factors influence the effects of an alternative on habitat capability and anadromous fish populations: 1) elimination of major barriers to fish passage by other agencies (such as the Army Corps of Engineers); 2) instream enhancement; and 3) control of timber harvest in and adjacent to riparian areas. You further state that given the current population of approximately 169,000 smolts in your waters and the levels of improved escapement (due to elimination of major barriers) and additional enhancement proposed by the alternatives, there will be little difference in anadromous fish production between the alternatives. All alternatives project a threefold increase in smolt production in the first decade, approximately returning the fishery to the level attained before its decline.

Because the alternatives differ considerably in sediment produced, we conclude that you feel sediment levels have little effect on the fishery. Appendix B to the DEIS, however, states that "...a fish model then integrated the erosion data from the forest planning analysis with riparian condition data to produce fish estimates," leaving out entirely instream investment and fish passage as contributing factors.

These statements in your DEIS lead us to the following points:

1) Investments in fish structures and facilities can certainly affect the capacity of the forest as a fish producer, but we are uncertain of the relationship between these investments and fish production assumed in your preferred alternative. This analysis should be expanded substantially. We need to know the opportunities here. In that discussion, you should document the past performance of such structures and the degree to which your preferred alternative depends on them to maintain the fishery.

2) We could not find a quantitative assessment of the benefits and costs associated with different combinations of instream investment and riparian policy. As an example, we need to know the least-cost way, in terms of timber production impact, of improving the fishery beyond the level in your proposed plan.

3) We need more discussion on how forest management activities can influence the fishery through their impact on sediment and stream temperature. As an example, how will the rate of harvest allowed in your watersheds influence stream sediment and temperature, and through that impact affect the fishery? This discussion should highlight watersheds containing your key spawning and rearing streams, such as the McKenzie River system. Information on this interaction will be an important ingredient in development of a State alternative.

4) You should explain the role of sediment in your fish production models. You appear to assume that the level of smolt production is largely independent of the level of timber harvest activity and road building. Have we misinterpreted your results here?

Your analysis of fishery impacts relates directly to various enhancement projects. As noted by the Oregon Department of Fish and Wildlife (ODFW), many of these projects will be funded and performed by other agencies like the Bonneville Power Administration (BPA). Yet the DEIS contains virtually no discussion of how you propose to coordinate your plans with their plans. Such coordination is imperative if the projects are to be successful. In the DEIS, other agencies' plans are merely cited (page IV-5); the consistency of the Forest Service's alternatives with these plans is not analyzed. Coordination with ODFW's subbasin plans is especially critical.

4. Big Game Habitat

Hunting and viewing black-tailed deer and Roosevelt elk are important recreational activities on the Willamette National Forest. We are concerned that adequate habitat be provided for these species. ODFW has set benchmarks for wintering animals at 120 percent of current levels for deer and 167 percent of current levels for elk.

Your preferred alternative projects the following population numbers for deer and elk over time in terms of a population trend index with 100 being the current level:

Year	1990	2000	2030
Deer	98	115	111
Elk	97	119	113

We believe that you are projecting habitat for each species rather than the populations themselves. According to these projections, though, your big game populations will rise over time but will not achieve ODFW benchmarks by the fifth decade of your plan--especially the elk habitat will fall short.

Your deer and elk analysis is extremely difficult to follow. Although you acknowledge winter range as the critical factor in habitat provision, you do not show the winter range on any maps and did not make it one of your "Management Areas". You state that (LRMP, IV-4), " Emphasis is placed on management of thermal cover, forage and roads to improve the conditions and quality of big-game habitat. With major areas of the Forest managed to maintain relatively high levels of habitat effectiveness for big game and other wildlife species, elk populations are planned to increase." In addition, you show that 37 percent of your winter range will produce "optimal thermal cover."

Exactly how do you place this "emphasis" to improve big game habitat and what are its costs? Could you achieve ODFW's targets through even more emphasis such as producing more forage through rotations shorter than currently allowed? Where are these "major areas managed to maintain high levels of habitat effectiveness" and the 37 percent of the winter range to which you refer? Since they are not Management Areas, and are not shown on maps, how will you achieve the goals for these areas? You should provide ODFW with the maps they seek, define a management area for winter range that will receive special treatment, and develop standards and guidelines for it.

How have you combined cover, forage, and roads to estimate habitat effectiveness? Your description of your wildlife model in Appendix B of the DEIS concentrates almost entirely on forage analysis, and, even here has inadequate depth. The deer and elk model in the DEIS of the Umpqua National Forest is an example of type of information needed. In addition, ODFW feels that you have underestimated the impact of open roads on habitat effectiveness. Please review ODFW's comments and discuss the implications of adopting its proposed open road density levels in your FEIS.

The Umpqua National Forest applies an intricate four-part strategy to its winter range in a sophisticated attempt to produce the combination of forage and cover that will maximize big game numbers. Yet they project that deer and elk habitat will diminish by one-third over the next fifty years. With seemingly less effort and focus, you project increasing big game habitat. Yet, to the untrained eye, your forests appear similar. Have you found a more productive approach to producing big game, or are your forests that different? Or do you simply measure habitat in a different way? Please work with the Umpqua to resolve or explain these seeming inconsistencies.

Finally, ODFW feels that the Forest is too large an area to use as a base for measuring habitat effectiveness as is done in the DEIS. While it is difficult to tell the size of the area you will use in implementing your plan, please consider the agency's comments.

5. Visual Quality

Oregon's tourism marketing campaign relies heavily upon the scenic splendor of Oregon's national forests. The natural beauty for which Oregon is famous is due in large part to the lakes, rivers, and forests that form the Willamette National Forest. Without a high quality view from high-use recreation sites and along the most traveled routes, the potential for tourism development is uncertain. The Forest plan should place a high priority on maintaining the scenic quality of key travel routes such as the Santiam, McKenzie, and Willamette River corridors. In addition, the forest around important recreation sites such as Detroit Reservoir, Clear Lake, Waldo Lake, and the Hoodoo and Willamette Ski Resorts should be given scenic protection, as should state scenic waterways such as the Little North Santiam.

You have more clearly presented the implications of your plan for visual quality than we have found in any other forest plans we have read. We appreciate your division of your "Scenic" Management Area into six subcategories based on distance (foreground, middleground) and visual quality objective (retention, partial retention, and modification). It would be helpful, though, if you could add highway travel statistics for the viewsheds so we could better understand levels of use.

You have inventoried your forest to assess relative scenic importance based on attractiveness, proximity to travelways and use areas, and the concern Forest users have for scenic quality. Through this process, the entire Forest is assigned one of five Visual Quality Objectives (VQOs), each representing a relative degree of acceptable alteration of the natural landscape with "preservation" allowing the least alteration and "maximum modification" allowing the most.

In developing an alternative, a VQO is assigned to each acre based on the Management Area to which it is assigned and the activities that will take place on it. The percentage distribution of your Forest as inventoried and as assigned in your proposed plan is as follows.

VQO	Inventoried (%)	Preferred Alternative (%)
Preservation	23	30
Retention	14	5
Partial Retention	29	8
Modification	29	14
Maximum Modification	5	43
	100	100

You have apparently reserved "preservation" for your Wilderness areas and for your Research Natural Areas (RNAs), special interest areas, and some of your old growth groves and dispersed recreation areas that do not allow timber harvest. Thus 23 percent (385,000 acres)--your Wilderness areas and established RNAs-were given the VQO of preservation in your visual inventory and five percent more--the proposed RNAs, special interest areas, old growth groves, and some of the dispersed recreation areas--were added to that VQO under your proposed plan.

The remainder of your forest was allocated to the VQO's other than preservation. In your proposed plan, we see a distinct shift in acres to less restrictive visual categories in comparison to the visual inventory, with almost nine times as many acres allocated to "maximum modification" as were inventoried that way.

We presume that the allocation in your preferred plan does not match that of the inventory because the cost of doing so would be too high, especially in terms of lost timber production. You have estimated timber production possibilities in your different visual areas as follows:

VQO	Foreground	Middleground
	% of full yield	
Preservation	0	0
Retention	62-84	74-84
Partial retention	74-94	95-99
Modification	95-99	98-99
Maximum modification	100	100

These results raise three questions:

1) Does the 84 percent of full yield in foreground retention and the 94 percent of full yield in foreground partial retention completely reflect the standards and guidelines for this management area? The yields seem high for even-aged management given the visual quality required. In all cases, you should check that the forest planning analysis correctly reflects the standards and guidelines of each VQO especially relative to the restrictions on type and rate of harvest.

2) If you can achieve the yields stated here (98-99 percent of full yield) in middleground modification, where most of the modification lies, why were so many acres allocated to maximum modification? Did you feel that the improvement in the view by shaping harvest units so they fit into the landscape and keeping them relatively small was not worth the loss of one or two percent in timber production? Even in your key viewsheds discussed below?

3) Have you considered uneven-aged management for your visual areas as a way to decrease the conflicts between scenic quality and timber production? In your Douglas-fir/true fir and true fir types, such an approach might cause the amount of true fir to increase over time. Still, that species change should not rule out uneven-aged management in your key viewsheds.

See the Economic Development Department's (EDD) comments for more details on these issues.

You have divided your forest into viewshed and nonviewshed areas, with the 10 viewshed areas covering major travel corridors and recreation sites such as the McKenzie Highway and Detroit Reservoir. One thing that would help our analysis is a map showing the VQO's for each viewshed under each alternative, or at least under the preferred alternative. The percentage distribution of the viewshed and nonviewshed areas as inventoried and as assigned in your proposed plan is as follows:

	Viewshed Areas (535,000 acres)		Nonviewshed Areas (1,140,000 acres)	
VQO	Inventoried	Preferred Alternative	Inventoried	Preferred Alternative
Preservation	--	14	34	37
Retention	34	14	5	1
Partial retention	43	19	23	3
Modification	20	41	33	2
Maximum modification	3	12	5	57
	100	100	100	100

In the viewsheds, under the preferred alternative, retention generally occurs in the foreground (near the road or recreation site) and partial retention and modification occurs in the middleground (up the hill or across the river from the critical view spot). The increase in modification over what has been inventoried will mean that fairly visible clearcuts will be seen in the middle distance in many viewsheds.

In the nonviewshed areas, your Forest will be one of stark contrasts: 1) the higher elevation lands, which are mostly in wilderness or in your proposed semi-primitive allocation, will be managed under preservation; and 2) the lower elevation lands where timber harvest is permitted will be managed with only minimal attention to scenic beauty. While the effect on the lower elevation lands will be diluted somewhat by the intermixed unsuitable and unavailable land on which timber harvest is not permitted, it is clear that some "visual shock" will occur because of how little inventoried partial retention and modification will be implemented.

In addition to describing the visual inventory and allocation by VQO, you describe the current visual condition and future visual condition of your viewsheds in terms of a rank of one to four with the relationship between VQO and visual condition defined on page III-110 of your DEIS:

Visual Condition	VQO
Natural appearing	Preservation-retention
Slightly altered	Retention-partial retention
Moderately altered	Partial retention-modification
Heavily altered	Maximum modification

You then rate the existing visual condition of each viewshed and the visual condition under each alternative (DEIS IV-35). These results puzzle us for a number of reasons which can be illustrated with two of your viewsheds:

	Little North Santiam		North Fork/South Fork	
VQO	Inventoried	Preferred Alternative	Inventoried	Preferred Alternative
Preservation	--	25	--	8
Retention	47	--	42	9
Partial retention	50	19	36	16
Modification	3	50	17	62
Maximum modification	--	6	4	5
	100	100	100	100

You state that both watersheds now have a "natural appearing" visual condition and that Little North Santiam will be "slightly altered" under the proposed plan while the North Fork (of the Willamette)/South Fork (of the McKenzie) will retain its "natural appearing" condition. By the definitions given above, both viewsheds will be largely a combination of partial retention and modification, which is the definition of "moderately altered". A similar result occurs on many of your other viewsheds meaning, by our estimate, you have underestimated the amount of visual degradation that will occur in your viewsheds under your proposed plan.

You compound the confusion surrounding this description by describing the table in which these results appear as "Expected Changes to Existing Visual Condition" when these definitions on visual condition refer to absolute condition, not change in condition. In addition, you describe the table in terms of change in condition. All this leads us to a number of questions:

1) Does "existing visual condition" refer to the actual appearance now of the viewshed or how it was inventoried? If it refers to actual appearance now, how is that measured and where are the results of this measurement?

2) Why does your interpretation of the visual condition in each viewshed under the preferred alternative seem to differ so much from the data you provide on distribution among the VQO's?

3) Does the visual condition estimated for the viewsheds under your preferred alternative refer to the plan period or some period farther into the future? And are these absolute measures or change measures? See EDD's comments for more detail on these issues.

We need more information on costs of different VQO's applied to foreground and middleground, such as the absolute impact on the allowable sale quantity for an acre allocated to each of the six categories of the "Scenic" Management Area. Please see the comments of OSDF for more detail on our needs. In addition, we would like to know the impact on the allowable sale quantity in your preferred alternative of implementing the VQO's as inventoried in the viewshed and nonviewshed areas.

6. Recreation Opportunity and Facilities

Recreation is second only to timber in its contribution to the local economy. Recreational opportunities are especially important on the Willamette National Forest because of its proximity to the most heavily populated and most rapidly growing parts of Oregon. The Willamette National Forest is the only one in Oregon accessible by public transportation facilities, making it accessible to people who cannot otherwise enjoy forest recreation experiences. In our review of the DEIS and LRMP we did not find the depth of analysis of recreation opportunities and demand that we need to develop our State alternative. We hope the FEIS can be expanded to address these concerns.

a. Trails

You recognize in the DEIS the increasing public interest in low elevation hiking trails close to urban areas. In fact, the 1983 SCORP shows a net need for walking and hiking trails by the year 2000 for Lane, Linn and Marion Counties. You proposed to build only 20 miles of trail in the next 10 years. In addition, your DEIS shows that timber harvest and other activities will impact many of the trails that now exist. In your planning documents, however, you analyze impacts of the alternatives on the trail system solely in terms of trail miles impacted. We appreciate and applaud this effort on your part--other forests did not even do this, but people do not think about trails in terms of mileage. Where are these trails that will be impacted? Are they the ones made popular by published trail guides? Are they the ones that are most utilized? We believe you need to add some type of quality evaluation for the trail system so that people can figure out whether popular areas are going to be impacted, not just abstract miles of trails. One way to do this would be to simply compare the trails impacted by the various alternatives with the trails listed in leading published trail guides, but there may be other ways.

In addition to better information on the actual trails impacted, we recommend that you consider the Parks and Recreation Division comments on the need to mitigate the impacts of timber harvesting on trails. They recommend that you show the cumulative impacts of timber harvesting on the recreational characteristics of the land area the trails traverse. They also suggest considering other timber harvest and road building techniques designed to minimize impacts on recreation values. We hope that you consider and evaluate their suggestions.

b. Waldo Lake--Century Drive Road

The various alternatives treat the Charlton Lake Road differently. In some alternatives it would be upgraded to two-lane paved and in others it would not be. There is little discussion in the DEIS of the impacts on recreational use of upgrading the road. What kind of traffic increase is expected? Would it improve recreational access and spread recreation use better across the forest, or would it have a greater effect on changing timber market areas? We urge you to consult with the Highway Division on anticipated traffic impacts as you expand the analysis of this proposal in the FEIS.

c. Developed Recreation Sites

Need for developed recreation sites is increasing. Several alternatives, including the preferred, only propose a 108 day season for these sites, rather than 120 days. We found no analysis of the impact of the difference in season of use and no consideration of whether distinctions should be made between sites, with popular sites, especially low elevation ones, remaining open longer. This information should be included in the FEIS. As pointed out by the Parks and Recreation Division, the impacts of timber harvesting on existing and new developed sites also needs to be displayed. The comments they make about mitigating timber harvest impacts and evaluating the cumulative effects on trails apply to developed recreation sites too.

The Parks and Recreation Division also believes that greater facility development is needed to accommodate existing and future demand in the Little North Fork Santiam canyon. We urge you to consider this recommendation carefully in development of the FEIS.

d. Shortfalls in Meeting Recreation Demand

The major potential shortfall in meeting recreation demand on the Willamette National Forest is in opportunities for semi-primitive motorized (SPM) and nonmotorized (SPNM) recreation. The shortfall is especially critical since many of the existing areas that will be lost under the preferred alternative are those most accessible to our growing urban population. Substitutes for these areas will be hard to find. Because of this we urge you to develop a Region 6 plan describing the cumulative impacts of the proposed forest plans on the availability of SPM and SPNM recreation opportunities. The Parks and Recreation Division has additional specific suggestions that you should consider as well for mitigating the impact of these shortfalls.

In the DEIS and LRMP you discuss various strategies for improving recreation use of wilderness areas while minimizing its impact on resource values. One way of doing this is by limiting group size and duration of stay. In adopting any such restrictions we urge you to be fair and equitable to all users, including professional outfitters.

e. Driving Guide

One public suggestion included in the DEIS was the idea of developing and printing special maps aimed at driving recreationists, whether ORV users or those using developed roads. If such a map were developed it could help minimize conflicts between forest users and improve drivers' recreational experiences. We believe the costs and benefits of this suggestion should be considered in the FEIS.

f. Special Interest Areas/Old Growth Areas

Several of the alternatives propose development and interpretation of Special Interest Areas. We did not find any discussion of what this meant or what affect it might have on use levels. We assume that it would mean developing marked, readily accessible nature trails with interpretive information and displays. This could be very beneficial to many recreational users of the Forest who are not interested in strenuous recreation, but would like an educational experience. Please discuss what you propose to do and the benefits and costs of it in the FEIS.

Many people attending our public meetings expressed their interest in maintaining the cathedral-like old growth groves on the Forest where they find spiritual renewal. You recognize this concern in your identification of old growth as an issue. Yet in your analysis you largely consider old growth from a silvicultural standpoint rather than in terms of recreational demand. In the FEIS we urge you to identify low elevation cathedral-like old growth groves responsive to this demand. The impact of the alternatives on them should be analyzed. Consideration should be given to how such groves should be managed from a recreational standpoint.

7. Other Considerations

a. Coordination with Local Land Use Plans

The DEIS and LRMP show little or no consideration of state and local planning efforts. We strongly urge you to study the Umatilla National Forest planning documents and adopt their approach. They showed county zoning districts in relation to surrounding and interspersed federal holdings. They also listed the affected county plans and implementing regulations. This type of information strengthens federal-state-local coordination and assists us in developing a state alternative. This is especially important for the areas adjacent to unincorporated towns within the Forest boundary.

b. Oregon Natural Heritage Plan

Nowhere in your discussion of Research Natural Areas (RNAs) and Special Interest Areas (SIAs) could we find any discussion of the consistency of your proposal with our state Natural Heritage Plan. It would help us if you could state whether particular potential RNAs or SIAs meet specific unmet natural area needs under our state plan. The FEIS should analyze the consistency of the proposed plan with our Natural Heritage Plan.

B. Resource Effects

The Forest needs to be more specific in describing the resources on the Forest and the specific consequences of proposed management activities. A number of questions and information needs remain before we can develop a State Alternative. More detailed discussions about them can be found in the agency comments. We highlight here some of our major information needs relative to resource effects. Our discussion is divided into five parts: 1) minimum management requirements, 2) fish and wildlife, 3) water and air quality, 4) roadless areas, and 5) wild and scenic rivers.

1. Minimum Management Requirements

All choices for managing the Forest must embody standards and practices to ensure basic protection of the environment such as maintenance of air quality, water quality, and the diversity of plants, animals, and ecosystems. In fact, we rely on your setting of these requirements to ensure that any forest planning alternative will not deprive future generations of their rightful share of the commodities and amenities that your Forest can provide.

You use "minimum management requirements" (MMRs) to disclose this baseline level of environmental protection, and, as you know, few aspects of national forest planning have generated more controversy. In part because of this controversy, the requirements are still somewhat unsettled since the Final Environmental Impact Statement for the Northern Spotted Owl has not yet been released.

We believe there is a need for further documentation and analysis of MMRs. Not only is it unclear what data were used in formulating the MMRs, we are also concerned that only one set of MMR strategies is proposed in the Plan. Where alternative methods for achieving the same objectives are available, displaying them would be beneficial. We also note that adjacent national forests model their MMRs differently. Where this occurs, display of the analysis to support these differences is needed.

One of the major criticisms about the setting of these requirements is that they were done without public involvement. Your "Sensitivity Analysis for Minimum Management Requirements (Appendix H)" is a major step toward alleviating this criticism. We feel, however, that it should go further. Specifically, we believe that you should more systematically demonstrate that you have examined the possible ways of meeting each management requirement and have selected an efficient method of doing so, given the objectives and constraints of your preferred alternative.

2. Fish and Wildlife

a. Management Indicator Species

ODFW is concerned with the adequacy of proposed management strategies for three management indicator species: 1) spotted owl, 2) pileated woodpecker, and 3) pine marten. For the spotted owl, ODFW recommends more and larger habitat areas then your proposed plan would maintain. We look forward to completion of your final supplemental EIS on spotted owl management to resolve this issue. For the pileated woodpecker, ODFW recommends larger nesting, roosting, and foraging habitat than you propose, larger nest trees, and a more contiguous habitat. For pine marten, ODFW recommends that continuous travel corridors be maintained with high levels of down logs. Please examine their comments carefully and assess the benefits and costs of their proposals so that we can consider their recommendations in developing the State alternative.

b. Old Growth Habitat

ODFW has two concerns about the proposed old-growth habitat management on the Forest: 1) whether these habitats have been properly distributed, particularly at lower elevations; and 2) whether there will be adequate old growth in each plant community. The Forest should display the amount and location of current and planned old growth habitats by plant community to help ODFW sort out the adequacy of your provisions. In addition, the Forest should follow the habitat definitions from "Regional Guide for the Pacific Northwest Region" when identifying old-growth habitat acreage by plant community.

c. Stream Habitat

It is essential that you protect and carefully manage your aquatic and riparian resources. Yet ODFW found your provisions for this management questionable. Provisions for stream surface shading are unclear. Stream sedimentation or turbidity standards and guidelines are not specific and cannot be measured. Please correct these problems.

Because large woody debris is an essential component of stream channels for dissipation of stream energy, channel and stream bank stability, and fish habitat, ODFW supports the Forest standard to maintain large, woody debris at 90 percent or more of the current level existing for any given stream or lake, but feels that the standard should be changed to 90 percent (or more) of the potential for areas that have already been entered for timber harvest. What would be the cost of such a change in terms of lost timber production?

d. Lake Habitat

Your nonwilderness lakes such as Clear Lake and Lost Lake are heavily used by wildlife and recreationists alike. We generally support the application of MA 9c (special lakeside habitat--protection) or MA 9d (special lakeside habitat--enhancement) to all nonwilderness lakes. It affects relatively few acres per lake and provides a much needed cushion that prevents activities that might damage the lake environment from intruding to the lake edge.

ODFW, though, found your criterion for application of these strategies somewhat unclear: all 30 candidate lakes on the Blue River, McKenzie and Rigdon Ranger Districts are assigned these prescriptions, yet none of the twelve lakes on the Oakridge Ranger District receives them. Please clarify.

e. Road Management

Road management and selective closure have gained prominence in recent years as a crucial element in maintaining habitat for big game. You should work with ODFW to develop specific criteria for establishing road closures to meet wildlife objectives that are fair to forest users. These standards are especially important for roadless areas you propose to develop. A transportation map showing location of existing and planned roads, including existing and planned closures, is also needed.

3. Water and Air Quality

Regarding air quality, the Department of Environmental Quality's (DEQ) primary concerns are those of air quality impacts from prescribed burning and burning of the Forest's fuelwood by the public in nearby urban areas. Prescribed burning smoke is a major source of fine particulate emissions within the State. More analysis should be presented on projected versus baseline pollutant emissions and on the potential for intensive utilization of woody residues for industrial purposes.

Regarding water quality, DEQ's concern is that the Plan be consistent with Oregon's adopted Statewide Water Quality management Plan for forest practices as required by the Clean Water Act. The Plan recognizes goals of meeting water quality standards and protecting beneficial uses of water. DEQ feels, however, that needed information is lacking in the DEIS and LRMP to assess adequately the water quality effects of activities, including analysis of baseline water quality conditions in individual streams and the effects of planned forest activities on those streams.

To demonstrate consistency with the Clean Water Act, we suggest you discuss how the alternatives satisfy the requirements of the Oregon Forest Practices Act. Particular attention should be given to the newly adopted rules for riparian area management.

4. Roadless Areas

Roadless areas containing approximately 209,000 acres in over 31 parcels remain from the Rare II inventory. These areas, by and large, were considered for Wilderness but not selected by Congress in the 1984 Oregon Wilderness Act. The Forest Plan will determine whether they will be available for development during the next 10-15 years. Many border newly created Wilderness on the Willamette. Others are undeveloped islands surrounded by lands on which a variety of activities take place.

These areas receive many types of recreational use in their roadless condition including hiking, camping, fishing, and hunting. In addition, they provide habitat for a variety of wildlife and are the source of clean, clear water. While some remaining roadless areas lie at higher elevations and are covered by grassy meadows or timber stands of low value and growth potential, many others, such as Middle Santiam , have timber stands of economic consequence.

Your proposed plan would assign 32 percent of this roadless acreage to Management Areas, such as nonmotorized semiprimitive recreation, which would allow no development; 13 percent to Management Areas which allow limited development; and 55 percent to full development. Because few of these roadless areas lie within your designated viewsheds, much of the area allowing full development will be under the VQO of maximum modification.

We believe that the 1984 Oregon Wilderness Act, by and large, determined which roadless areas should be left in a wild and untrammeled condition. They were designated as Wilderness. Remaining roadless areas should not be placed in roadless recreation management status simply because they border existing Wilderness. Rather, we believe this allocation should be reserved for areas whose properties stand on their own as a reason for prohibiting roadbuilding and timber harvest. This summer we will visit each roadless area on the Forest during development of the State alternative. Then we will make a site-specific recommendation on each one.

Because we plan to make site-specific recommendations in our State alternative, we need to know the benefits and costs of different treatment of these areas. Your discussion on the allocation of each roadless area by alternative and on the resource outputs, environmental effects, and activities is among the best we have seen. Still, we lack needed information such as acres suitable for timber production in each roadless area and an estimate of the impact on allowable sale quantity under each alternative. In addition, a summary of these results over all roadless areas would have helped considerably in our attempt to achieve an overview.

We were disappointed that you chose not to give equal attention, or even acknowledge, the 24 "roadless" areas that you have mapped outside of your RARE II inventory. Included in this group are such well known areas as Browder Ridge and The Pyramids whose fate is of importance to many people. We find no analysis of these areas and, as an example, see Browder Ridge mentioned only once in the DEIS and LRMP when you acknowledge that your plan proposes to manage it as "semi-primitive, nonmotorized."

We will need information on the resource outputs, environmental effects, and activities under each alternative for these 24 areas, much like you provided for the 31 Rare II roadless areas, before we can develop the State alternative. Also, please include this information in your FEIS.

On page II-61 of the DEIS, you describe very briefly four special areas where you worked with consensus groups to reach agreement on future management. These are Three Creeks, South Fork, Fall Creek and Hardesty Mountain. Brief references to these "agreements" for South Fork and Hardesty Mountain are also made in Appendix C. We support consensus decision making when possible, but we cannot determine where these areas are or what the agreements were, or who was involved in reaching consensus. It would help us if you could elaborate on these "agreements."

5. Wild and Scenic Rivers

We agree that the McKenzie River from Tamolitch Falls to McKenzie Bridge is eligible as a Recreational River under the federal Wild and Scenic River Bill. While we will not make our final recommendation until consideration of Senator Hatfield's Omnibus Rivers Bill is further along, we believe your discussion of your conclusion needs to be improved.

Several other rivers on the Willamette Forest are either designated State Scenic Waterways (the North Fork of the Middle Fork of the Willamette including Waldo Lake and the Little North Fork of the North Santiam) or are included in the House version of the Omnibus Rivers Bill (the Breitenbush, North Santiam and the Little North Fork of the Santiam including Opal Creek). Oregon State Parks Division studied Opal Creek and concluded it did not meet the criteria for our state system. We believe that all of these rivers should be examined for eligibility as candidates for designation in the federal system to provide Congress with the information it needs for its deliberations. The State's Opal Creek Study is available from the Parks and Recreation Division.

Finally, our state studies indicate that the South Santiam from its source to Foster Reservoir, the South Fork of the McKenzie and the Middle Fork of the Willamette are good potential scenic rivers or have outstanding recreation values. They should also be examined for eligibility in the federal system. See State Parks and Recreation Division comments for detail.

As noted above, the State has not yet decided what to recommend on pending federal legislation regarding federal designation of these rivers, but until Congress acts these rivers should be managed to protect their eligibility. We also would like assurances that your lands along existing designated State Scenic Waterways will be managed consistent with that designation. Please see the comments of the Parks and Recreation Division regarding the viewshed impacts along the Little North Fork of the Santiam. As noted in our earlier discussion of visual quality, under your preferred alternative the Little North Fork is the only major viewshed to decline in appearance and yet it is specially protected under state law.

D. Economic Effects

We have several suggestions for improving your analysis and portrayal of the economic affects associated with your preferred alterative. We have highlighted six major areas of concern here: 1) employment impacts of the preferred alternative; 2) estimation of timber supply and demand; 3) recreation activity value; 4) recreation supply and demand; 5) mineral exploration; and 6) O & C lands/county revenues. Please see the comments of EDD, the State Economist, Department of Geology and Mineral Industries (DOGAMI), Parks and Recreation and OSDF for more details.

1. Employment Impacts of the Preferred Alternative

Your DEIS defines the activities of the years 1977-1985 as the historical base for comparing the economic effects of the plan alternatives. The 1977-1985 averages for timber harvest and sale quantities do not represent what the surrounding counties have experienced over the last few years. This period includes a severe recession and does not incorporate the recent upturn in the industry. During the period 1985-1987, the counties have had much higher harvests than the 1977-1985 average as companies cut their accumulated timber under contract with the return of high stumpage prices.

Your conclusion that the timber harvest under your proposed plan will rise in comparison to the 1977-85 average may cause people to believe that the timber supply will expand which in turn will enhance economic growth. In reality, though, the projected increase in jobs, personal income, and payments to counties has already been realized through the higher harvest levels of the last two years, and your proposed allowable sale quantity is lower than the 1985-1987 average harvest. As a result, we face a contraction in timber-based employment under the proposed Plan in relation to the current situation.

We believe that it is imperative that the Forest compare the proposed allowable sale quantity and associated economic effects to the most recent three years in addition to the longer period. You should expand your base period to include 1986-1987 giving you 11 years (1977-1987) for comparison.

You constructed your IMPLAN model and removed part of the selling value of the stumpage to account for leakage from local economies to the Federal Government for stumpage. This adjustment makes comparison of employment and income among forest inaccurate because the coefficients are not comparable. You should also document whether an adjustment was made for stumpage that was returned because of contract relief, or was defaulted on, or processed unprofitably.

2. Estimation of Timber Supply and Demand

Your projections of private timber availability are based on a decade-old study. The Southwest Oregon Subregional Market Model from the Pacific Northwest Station will soon be available to make reasonable estimates of stumpage demand. Also, the aggregate timber supply analysis from Oregon State University will be available this summer. Both should be consulted in preparing the FEIS.

3. Improving Recreational Activity Valuation

Your analysis apparently reduced the value of recreational activities by 37 percent. In addition, you assigned a 0 percent real price trend to these activities while applying a one percent real price trend for timber. We believe that these assumptions can result in a serious undervaluation of the contribution recreation makes to the wealth derived from the Forest, and you should support these assumptions or change them.

Another problem with your presentation of the value of recreational activities if the present net value for recreation is only presented forestwide. Yet recreation activities contribute various economic returns and the activities themselves are often concentrated in specific areas, like river corridors. Some site- or area-specific analyzes should be made if we are to make informed decisions about the economic trade-offs involved. Otherwise, as noted by the Parks Division, we face a risk of unwittingly trading high value recreation sites for marginal timber values.

4. Recreation Supply and Demand

We believe that you should base your projections of recreation use on historical use trends on the Forest and demographic trends from locations that provide a majority of your use where such data exist. Your trends seem activity-specific reflecting public preferences for different types of recreation activities but we are unsure of the sources of your information. Your analysis should also highlight the different growth rates in demand by in-state and out-of-state recreationists.

As suggested by the State Economist, we were disappointed that you did not attempt to value the economic impact of recreation. Other National Forests, like the Umpqua, did so. Since recreation is an important use of the Forest, second only to timber in its economic contribution, more valuation analysis is needed.

5. Mineral Exploration and Geothermal Resources

The Willamette National Forest is a geologically diverse area. While the demand for Forest minerals is highly variable, many are strategically important and maintaining access to them is of state concern. While you integrated the concept of mineral potential into development of alternatives, the economic potential of mineral development is not adequately recognized.

The Forest should quantify the value of the mineral resource to the extent feasible, and factor that value into the various alternatives. These values can be very high on particular sites and should be considered in evaluating different alternatives. The vague qualitative estimates used in the DEIS are of real concern to DOGAMI, especially when much better information is readily available (for example on geothermal resources). We encourage you to maintain exploration access to as much of the Forest as possible, particularly for low impact exploration measures. Instead, in the DEIS and LRMP you appear to be planning access restrictions even on existing patented and unpatented mining claims. We believe you should recognize the legal right of access miners have to their claims.

In several alternatives you propose restricting use of Forest common mineral materials to Forest Service and cooperative agencies only. It is not clear in the DEIS how much use by others actually occurs and how much "outside" demand exists for such materials. Before we could make any recommendation on this policy choice, we need to know this information. It would also be useful to know where the major quarry sites area.

We are also concerned about the effect of certain management prescriptions on geothermal development. You do not appear to recognize the difference between direct and indirect use of geothermal energy. The environmental impacts of these types of development are quite different. Direct use of geothermal energy may be quite appropriate even in sensitive areas like the McKenzie River corridor. If areas with high geothermal potential are going to be managed to protect other values (like the Partial Retention management in the Santiam Pass area), we need to know what the impact will be on geothermal development. Please see comments of DOGAMI and the Oregon Department of Energy for details.

6. O & C Lands/County Revenues

The Willamette National Forest manages 51,000 acres of O & C lands. These lands are particularly important to local governments since 50 percent of the timber revenue is transferred to the counties. The FEIS should show the location of these lands, how they are treated in the various alternatives, and their contribution to county payments. See comments of OSDF for additional detail.

Unlike other Forest DEISs we have reviewed your DEIS does not indicate the extent to which the six counties in which the Forest is located depend upon revenue from the Forest. At least for the three main counties, you should determine the percentage of the total county revenue represented by timber sale and other National Forest revenues. This will help us evaluate the impact of your proposed plan on local government. See the comments of the State Economist and OSDF.

D. Other Considerations

The Willamette National Forest is the twelfth of the thirteen national forests in Oregon to publish a management plan. The State may modify its position and recommendations on individual plans when the aggregate effect of these plans has been determined on resource outputs such as timber, salmon and steelhead, big game, and recreation opportunity. Therefore, we urge the Forest Service not to adopt any plan until the cumulative effects of all draft, revised draft, and supplemental national forest plans are known by the public.

Further, we urge you to continue managing the Willamette National Forest under the existing management plan until a new plan is in place or until amendments to the existing plan are developed and approved with participation by the State of Oregon. In the interim, constraints should not be applied to existing plans in contemplation of the new plan without full public participation.

Attached to this letter are reviews of the Willamette National Forest DEIS and LRMP completed by affected State agencies. These reviews consider economic, social, environmental, and legal aspects of the planning documents. They contain substantive technical comments, on the quality of analysis and the information needed to make an informed assessment, that should be considered an integral part of the State response. In addition, the reviews contain suggestions on how your proposed plan can be changed to better meet State agency goals. After we construct the State alternative for your Forest, you will be able to assess the State position on each of these agency suggestions regarding which outputs should be emphasized on your Forest.

Thank you for the opportunity to respond to the Willamette National Forest DEIS and LRMP. The State of Oregon stands ready to help you as you move forward in completion of your Forest Plan. For assistance on our comments about the overall planning process and procedures, feel free to contact Norm Johnson, Federal Forest Plans Coordinator. For assistance on particular resource issues, please contact the appropriate individual indicated on the enclosed list of agency contacts.

Sincerely,

Neil Goldschmidt
Governor

NG:cs

Enclosures

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Oregon Department of Agriculture

635 CAPITOL STREET NE, SALEM, OREGON 97310-0110

DATE: February 18, 1987

TO: K. Norman Johnson, Federal Plans Coordinator

FROM: Bill Kosesan, Assistant Director

SUBJECT: DRAFT COMMENTS ON THE WILLAMETTE NATIONAL FOREST PROPOSED LAND AND RESOURCE MANAGEMENT PLAN AND DRAFT ENVIRONMENTAL IMPACT STATEMENT

The Oregon Department of Agriculture is pleased to submit the following comments on the above referenced documents.

General

As implied in the Proposed Land and Resource Management Plan (LRMP) and Draft Environmental Impact Statement (DEIS), the Willamette National Forest is a resource of tremendous economic, social, and environmental importance, not only to the state of Oregon, but the entire nation. Its status as the top timber producing forest in the United States, its proximity to Oregon's major population centers for recreational use and its water yield of 8.4 million acre feet, are all indicative of the importance of the Willamette National Forest to Oregonians and the impact the proposed LRMP has for the state. For these reasons, the department is pleased with the comprehensive manner in which critical resource issues are addressed in the LRMP and DEIS.

Livestock Forage

The planning documents state that a goal of the forest is to provide forage for domestic livestock and to facilitate use of the forest's transitory range, consistent with demand. It is also stated that the heavily forested Willamette has limited capacity for grazing use. Even though a goal of the forest is to provide domestic livestock forage, the physical characteristics of this particular forest in large measure preclude this. As stated, plant forage potential is under utilized, yet the economic realities of grazing available transitory allotments are no doubt primarily responsible for the limited demand for grazing on the Willamette.

Economics of the livestock industry have improved since the statement was authored in the DEIS: "Given current market conditions there will be no significant changes in livestock grazing in the foreseeable future". However, due to the specific forage characteristics on the Willamette and the lack of proximate home ranch properties, the department concurs, for the most part, with the above referenced conclusion. However, the forest is encouraged to maintain currently held allotments and to consider future increases based on industry needs.

Soil and Water Resources

Throughout the LRMP and DEIS, considerable attention is given to the management of riparian areas. An excellent discussion of the nature and importance of these areas is provided. The department agrees that this is a critical element of the draft plan. To assist in our evaluation of current riparian conditions and assessment as to the adequacy of the plan in relation to this important resource, a chart detailing the condition of specific riparian areas would be useful.

One important consideration for successful riparian management is the realization that riparian areas cannot be treated as separate entities from the rest of the watershed. Successful riparian enhancement efforts must involve the associated uplands as well. Management must be extended to these areas or riparian improvement will be limited. The plan could more completely tie together the management of riparian areas with that of associated uplands.

The DEIS states that riparian areas and fish habitat are protected through mitigation measures which reduce timber harvest entries, require directional felling, and maintain adequate supplies of large woody debris. However, in reading through the LRMP and DEIS, a clearly defined strategy for riparian recovery and watershed enhancement is not, in our opinion, well articulated. Considering the intense interest in these resources and their attendant impact on water quality, etc., a strategy of this nature could be more completely detailed in these documents.

Both the LRMP and the DEIS contain a superior discussion of the characteristics of forest soils and the impact of these characteristics on management activities. The DEIS provides an excellent treatment of mitigation measures planned to maintain soil productivity and decrease erosion, mass wasting, etc. It is interesting, however, that these measures yield no projected decline in negative soil effects during the first decade. It would be our hope that implementation of activities of this nature could be tied to a reduction in negative soil effects.

Noxious Weeds

The DEIS contains a limited treatment of noxious weeds under the section dealing with mitigation measures for range. It is the opinion of the department that noxious weeds impact more than range management and that a more comprehensive strategy for their control on forest lands should be identified in a plan of this nature and duration. It would be helpful if a listing of weed species present on forestlands were provided in the DEIS. As the state agency with statutory responsibility for weed control in Oregon, the department stands ready to assist the forest in the development of a plan for noxious weed control.

Threatened and Endangered Plant Species

The issue of threatened, endangered and sensitive plants is addressed under Section G (Vegetation) of Chapter III (Affected Environment) of the Willamette National Forest DEIS. The proposed plan correctly indicates that there are no federally listed threatened or endangered plants on the Forest. It states, however, that 21 species on the Region 6 sensitive list occur, or are suspected of occurring, on forest property. It would be helpful if a table could be provided that identified these species, and indicated which are federal candidates for listing and which are not.

Some wording exists in paragraph 4 (page 3-55, DEIS) that requires clarification. Sentence 3 implies that the forest currently employs field methods that can predict demographic trends within populations of sensitive species. Depending on the methodology, there is some question as to whether such predictions are sufficient to determine the "viability" of a species, as suggested in sentence 2. Does the forest have in place, or plan to initiate, long-term analyses of populations? If not, then it is impractical to identify or predict significant downward trends in numbers or density. In paragraph 5, the sixth sentence indicates that if a sensitive species is found in an area of proposed activity, "then a determination needs to be made as to the extent of the population in the area occupied so as to determine the impacts on the plant if the activity should occur..." Quantifying a population is an obvious first step in the mitigation process, but what other types of studies does the forest propose to use to evaluate potential impacts to a species? These, along with the earlier implied demographic methods, need to be spelled out in more detail somewhere in the plan. It is clearly not feasible to attempt to outline a plan of action for each of the sensitive species present on the forest. However, a general discussion of the types of data that could be gathered in response to typical forest management practices (i.e., logging, road building, herbicide application, etc.) would be appropriate.

The department applauds the forest's decision to include the management of threatened and endangered plant species as part of its long term planning process. The proposed level of funding for this activity ($7,000 per annum for a potential 21 species) may be inadequate, however, based on appropriations by other state and federal agencies involved in similar work. In contrast, an estimated $99,000 yearly is being allocated for the management of four sensitive bird species, including $30,000 for one (the Peregrine falcon) that is not even known to nest on forest property.

bmR11-3N

NEIL GOLDSCHMIDT GOVERNOR

Department of Energy

625 MARION ST. NE, SALEM, OREGON 97310 PHONE 378-4040 TOLL FREE 1-800-221

TO: Norm Johnson, Executive Dept. Date: Feb. 10, 1988

FROM: Alex Sifford, Department of Energy

Ref.: Willamette National Forest Proposed Plan

The Oregon Department of Energy (ODOE) has reviewed the Willamette National Forest Proposed Land and Resource Plan, DEIS and Appendices. The comments below are for the coordinated state response.

For the Willamette National Forest, ODOE is interested in policies and standards for developing forest energy resources, siting large power projects and transmission line corridors.

Forest Energy Resources

The likelihood of finding exploitable energy resources on Willamette National Forest lands varies with the resource. Fossil fuels and hydroelectric are generally the least likely to be found in economic quantities. Geothermal energy on Willamette National Forest lands is evidenced by both hot springs and geology. Geothermal industry exploration continues. ODOE agrees with the Overall Standards and Guidelines Section A, Minerals and Energy #2 regarding geothermal energy development. The restrictions to geothermal resources proposed under the preferred alternative are acceptable to ODOE. Any future development would be in accordance with Environmental Assessments & Impact Statements for the Belknap-Foley, Breitenbush and McCredie Known Geothermal Resources Areas (KGRAs).

Wood residues resulting from timber harvesting include biomass energy resources. The standards cited in the proposed plan refer to these resources under the fuel loading and air quality sections. It is suggested that in response to the need to reduce slash burning, environmentally acceptable use of these resources as fuel (and fiber) be considered under whichever alternative is adopted.

The Oregon Department of Energy is an Equal Opportunity Employer

Siting Large Power Projects

Should a power plant larger than 25 MW in size be proposed on Willamette National Forest lands, it would likely use forest energy resources. The above comments therefore apply. ODOE concurs with the statement in the DEIS that "...in the near term, it seems unlikely that any large scale energy production or development will occur on Willamette NF lands". More importantly, any such facility would come under Energy Facility Siting Council review and requirements.

Transmission Lines

Oregon's Energy Facility Siting Council reviews and approves electric transmission lines in excess of 230 kilovolts and natural gas lines at least 16 inches in diameter. ODOE agrees with the Overall Standards and Guidelines Section A, Land Uses #2 regarding utility transmission corridors. The interagency coordination spelled out in that section will include participation by the state Energy Facility Siting Council.

If either you or Bob Brown need more information please call me at 378-2778.

AS
4041J

Department of Land Conservation and Development

1175 COURT STREET NE, SALEM, OREGON 97310-0590 PHONE (503) 378-4926

February 1, 1988

TO: Norm Johnson, Federal Plans Coordinator

FROM: Jim Knight, Special Assistant for Coordination

SUBJECT: Preliminary DLCD Issues and Comments on Willamette National Forest Plan

Our Department's preliminary issues and comments on the Willamette National Forest Plan and DEIS fall under the general heading of coordination of the proposed plans with the statewide planning goals and acknowledged comprehensive plans of cities and counties in the Willamette's planning area.

As you know from our comments on other forest plans, the statewide goals and acknowledged comprehensive plans of cities and counties are not technically binding on federal resource management activities outside of Oregon's coastal zone. Nevertheless, it continues to be DLCD's position that the state's overall response on each forest should stress the importance of having the Forest Service's various alternatives be as compatible as possible with the comprehensive plans of affected cities and counties.

It is clear that the Willamette's planning team has attempted to produce a forest plan and DEIS with considerable interest group and citizen involvement. Our review of the Willamette's documents, however, reveal that coordination with state and local planning efforts is not directly discussed. For example, it appears that there is nothing in the Willamette DEIS which is comparable to the Umatilla National Forest's depiction of county zoning districts in relation to surrounding and interspersed federal holdings. The Umatilla also listed the affected county comprehensive plans and implementing regulations, including their dates of adoption. Finally, the Umatilla prepared some general findings explaining the overall effect of the forest alternatives on the statewide planning goals.

Inclusion of this type or similar information in forest plans is valuable not only for strengthening federal-state-local coordination also for assisting the state in deciding upon a preferred alternative for each forest.

DLCD requests that the state's response on the Willamette ask the Forest to do more to demonstrate that it management alternatives are compatible with the state land use goals and with the comprehensive plans of the surrounding communities. Specifically, the Willamette should attempt to obtain from local government planning authorities written indications concerning the relationships of city and county land use policies, map designations and implementing regulations with the alternatives being proposed by the Forest.

While the relationship of each comprehensive plan with the Willamette will vary, an assertion by the Forest that its plan (and the various alternatives) are compatible with the plans of the communities in the area should be based on the following factors:

--Identification and discussion of applicable resource concerns, geographic areas, issues or problems described in comprehensive plans which relate to or are affect by the Forest;

--Compatibility, where possible, of comprehensive plan policies with the Forest's resource use and management recommendation and standards;

--Avoidance and mitigation of specific use, activity and resource conflicts (e.g., dwellings and structures in areas of high fire danger or resource value) which may occur in and along the boundary area between federal and nonfederal ownerships; and

--Coordination of federal and local land use classifications and designations in areas of scattered tracts and intermingled ownerships. Such coordination can relieve problems and expedite procedures involving land exchanges between various owners, transfers or leases to other agencies and the public sale of federally-owned holdings.

In the interests of time, this memo consolidates DLCD's issues identification and preliminary comments on the Willamette National Forest. Please feel free to contact me if your have any specific questions concerning our comments.

JBK
<sac>Willamette Prelim.Comments.

cc: James F. Ross, DLCD
Craig Greenleaf, DLCD
Brent Lake, DLCD
Mel Lucas, DLCD
Bob Rindy, DLCD
Jim Sitzman, DLCD

Department of Environmental Quality

811 SW SIXTH AVENUE, PORTLAND, OREGON 97204-1390 PHONE (503) 229-5696

May 13, 1988

NEIL GOLDSCHMIDT GOVERNOR

K. Norman Johnson
Federal Plans Coordinator
Executive Department
155 Cottage St. N.E.
Salem, Oregon 97310

Re: Draft Environmental Impact Statement for the Willamette National Forest Plan

Dear Mr. Johnson,

The Department has reviewed the draft Environmental Impact Statement (DEIS) for the Willamette National Forest Plan and provides the following draft comments for use in preparing the coordinated state response. These comments are related to air quality and water quality impacts of the proposed Plan. The deficiencies outlined below must be resolved before we can determine the consistency of the alternatives with respect to federal and state environmental rules, regulations and policies. The Department will not be supporting a "preferred alternative" unless it is determined that one or more of the alternatives fails to meet these requirements.

Regarding air quality, the Department's primary concerns are those of air quality impacts from forest prescribed burning and the burning of the Forest's fuelwood by the public within urban areas.

The Forest Plan DEIS indicates that prescribed fire emissions will be declining below the historical (1979-1985) average of 14,173 tons of particulate per year. It is not clear, however, how the 1979-85 average emission level compares to the PSD baseline period (1976-79) being used for forest planning. The DEIS should clearly specify the baseline emission level to assure that the Plan is consistent with Clean Air Act PSD provisions.

In addition, the Plan should show that the Forest Service is not subsidizing the public's use of fuelwood. Both of these issues focus on the Forest's policy of the highest and best practicable use of forest residues. The Forest Plan should work toward better develop management alternatives that will minimize prescribed burning smoke while supporting the utilization of woody resides.

Regarding water quality, the Department's concern is that the plan be consistent with Oregon's adopted Statewide Water Quality Management Plan for forest practices as required by the Clean Water Act. It is important to ensure that the proposed activities of timber harvest, road construction,

chemical handling and usage, sewage disposal, livestock grazing and other forest land activities comply with Oregon's Water Quality Standards and Guidelines and be monitored for the effectiveness in complying with these standards. The plan does recognize goals of meeting water quality standards and protecting beneficial uses of the water. However, important information is lacking in the Plan and DEIS to adequately assess the water quality effects of the activities in a multiple use forest, including sediment production and management controls in specific watersheds. In addition, findings need to be made regarding the relationship between baseline water quality conditions and the effects of the planned forest activities.

Thank you for allowing us the opportunity to review the DEIS. The Department looks forward to reviewing the proposed state response.

Sincerely,

Fred Hansen
Director

FH:p
MP1493
Attachment

Willamette National Forest Plan DEIS Comments

Department of Environmental Quality
811 SW Sixth Avenue
Portland, Oregon 97204

I. Air Quality

The following comments summarize Department of Environmental Quality, Air Quality Division concerns that should be addressed in the Draft Willamette National Forest Plan. Comments are organized into 3 sections, each of which should be addressed in the Draft Forest Plan:

A. Prevention of Significant Deterioration Requirements

B. Consistency with respect to Federal and State of Oregon Environmental Policies.

C. Other Comments

Forest Planning Impact Analysis

The principal issue of concern to the Department is that of air quality impacts related to forest prescribed burning, urban air quality impacts resulting from residential use of fuelwood from the Forest and the highest and best practicable use of forest residues.

A basic requirement of all National Forest Plans is presentation of an analysis of planned prescribed burning in relation to past burning activities. If it can be shown that projected annual and daily air pollutant emissions do not exceed, or are expected to be less than that which occurred during the 1976-1979 baseline period (using emission estimation methodology for baseline and future years developed by Sandberg, et al, USDA Forest Service), then issues discussed below are satisfied and no additional technical analysis of these issues is required.

A. Prevention of Significant Deterioration

While the DEIS indicates that emissions will be decreasing from the 1979-85 average, no reference is made to the 1976-79 baseline emissions. If it is clear that prescribed burning emissions will not exceed those during the baseline period, a broader technical analysis of expected impacts on PSD increments to clearly demonstrate that planned increases in prescribed burning emissions are consistent with federal and state air quality regulations, rules and policies is not required.

Part C of the Clean Air Act, requires the Department to insure that pollutant increments in Class I areas (Table 1) do not exceed specific limits adopted by Congress irrespective of the originating source. To assure that these increments are not exceeded due to planned increases in prescribed burning emissions, a technical analysis of the impact of

planned burns on nearby Class I wilderness and Class II lands would be required. As noted above, such an analysis would not be required if it can be shown that the proposed burning activity would not exceed that which occurred during the baseline period. If the analysis indicates significant impacts, specific measures designed to mitigate the impacts must be described in the Draft Forest Plan.

B. Consistency With Federal and State Environmental Policies.

Department policy (OAR 340-20-001) requires that Highest and Best Practicable Treatment and Control be applied to pollution sources within Oregon. OAR 340-13-005, Environmental Standard for Wilderness Areas, set forth policy on environmental impacts within wilderness lands while USDA Forest Service Region VI policy (Service Manual No. 2400, Supplement 347, March 1985) requires that, in recognition of the value of forest residues utilization, prescribed burning only be accomplished for those units where all other alternative treatments are unacceptable.

1. Fuelwood cutting program consistency with environmental policies:

The Department has become increasingly concerned about residential wood smoke impacts on urban air quality. Fuelwood cutting programs managed on the Willamette National Forest is a major and inexpensive source of fuelwood for Oregon residents. Although the DEIS does note (page IV-44) that as much as 73,000 cords of fuelwood would be taken from the Forest under one of the alternatives, the DEIS does not discuss the serious environmental consequences of the fuelwood program and it's consistency with Federal and State environmental policies. Specifically, the DEIS should clearly demonstrate that woodcutting fees are not subsidizing the public's use of fuelwood.

2. Highest and best use of wood residues:

Department policy (OAR 340-20-001) requires that highest and best practicable treatment and control be applied to pollution sources within Oregon. Since prescribed burning smoke is the largest source of fine particulate emissions within the State, the Draft Forest Plan should include consideration of an alternative that assures the highest and best practicable treatment of forest residues focusing on intensive utilization of woody residues for industrial purposes. As noted in the DEIS, it is important that the Forest Service work toward alternatives that will minimize prescribed burning smoke while continuing to support utilization of woody resides.

C. Other Comments

The DEIS notes (page IV-41) that "no emissions from forestry burning have yet been identified by the Environmental Protection Agency (EPA) as hazardous to human health...". While the statement is true, it is also true that EPA does not categorize the health effects of pollutants

in terms of sources. The health hazardous of emissions are identified on a pollutant basis, including carbon monoxide, particulates and toxic air pollutants which are emitted from a variety of sources including prescribed fire. The statement in the DEIS is misleading and in conflict with other Forest Service environmental impact statements. The DEIS on Managing Competing and Unwanted Vegetation notes that (page IV-120) "The various components of smoke include, among others, polycyclic aromatic hydrocarbons (PAH's) benzo-a-pyrene (BaP), dioxins, formaldehyde, acetaldehyde, phenol and manganese" and that (page IV-123) "Our confidence that no adverse human health effects will occur due to exposure to fire smoke at levels reaching population centers is uncertain." We feel that the final EIS should more accurately reflect what is known about the health effects of smoke.

II. Water Quality

The Management Plan and DEIS were reviewed within the concept that land management activities have the potential to beneficially or adversely impact the quality of the waters in the forest land downstream from the forest. The Management Plan has the opportunity to improve existing degraded resources and to maintain or protect existing desired resource conditions. The level of emphasis placed on water quality conditions and the processes used to protect that quality, play an important role in providing guidance to the managers on a project-by-project basis in the future.

The Water Quality Division comments are detailed in the following sections.

A. Consistency with Provisions of the Clean Water Act.

Fish habitat, recreational uses and water for domestic use are all recognized beneficial uses of the waters within and emanating from the Willamette National Forest. The Department of Environmental Quality's statutory obligation is to protect, maintain, and improve water quality for these uses. The Department does this, in part, with the help of the Federal Clean Water Act and Oregon water quality standards contained in the Oregon Administrative Rules (OAR).

The draft Willamette Forest Plan provides a goal for meeting state water quality standards. The Plan also provides standards and guidelines for water that will meet standards through application of Best Management Practices (BMP) at the project planning level. We believe these are compatible statements, both of which, if achieved will maintain or improve water quality in the forest. To strengthen these statements and avoid misinterpretation of goals, we suggest specific references to Oregon's water quality standards (OAR Chapter 340, Division 41) and Oregon's forest practice rules (OAR Chapter 629, Division 24) be added to the water resources goal statements (p. IV-2, proposed Plan) and the statements in the forest-wide standards section beginning on page IV-39 of the proposed Plan.

The Plan should also provide standards for wastewater systems. We request that the following language be added to the forest-wide standards section beginning on page IV-39 of the proposed Plan:

> "Sewage treatment and disposal facilities shall be approved by the Department of Environmental Quality or its contract agents and shall be in compliance with rules of the Environmental Quality Commission".

The forest staff should be commended for the following work that went into producing the proposed Plan and draft Environmental Impact Statement (DEIS).

- The discussion of environmental consequences that accurately portray land management impacts on water quality and soil values.
- The in-depth compilation of recent studies of mass wasting into an understandable component of erosion yield.
- The conclusions arrived at concerning timber harvest and road construction activities effect on surface and debris sludge erosion.

To further strengthen the proposed Plan and DEIS we offer the following comments:

1. Delineate riparian areas for the Forest's 6,621 miles of Class IV streams as was done for the Class I, II, and III streams (DEIS, Figure III-G-5). Though they do not have water flowing down them year around the vegetation is of riparian nature, and when they do flow they have a cumulative effect on the downstream perennial streams.

2. Throughout the DEIS and Plan the Allowable Sale Quantity (ASQ) given for the preferred management direction over the next decade has been at a 568 MMBF annual rate. The rate for road construction over that same period has been 56 miles of local roads per year.

   However, in Appendix C of the Plan listing the Timber Sales Ten-Year Action Schedule we come up with figures different than those listed above. Over the ten year period the average ASQ annually, excluding miscellaneous salvage, comes to 684 MMBF. The road construction figure is 75 miles annually. This is an increase of 20 percent and 34 percent respectively.

   The Ten-Year Schedule rates for timber harvest and road construction could have a significant effect on sedimentation rates and water quality if they are indeed the correct figures. Please review these harvest figures to determine if the apparent discrepancy is valid.

3. With thirteen of the 26 watersheds identified as having sedimentation problems we question the prudence of timber harvest of any kind in the riparian areas. With most of the roadless areas opening up to harvest activities perhaps the time is right to give the riparian areas more recovery time from harvest impact. We would like you to consider a no-harvest prescription in the riparian areas of the troubled watersheds. Perhaps the roadless areas can fill the harvest void.

4. Quantitative indicators for water quality - Adverse Watershed Impact and Amount of Erosion - show virtually no change for the next decade over the previous decade (Figure III-B-1 page 5 of the Plan). Thirteen of the 26 major Forest watersheds cited as having the most prominent sediment related problems have 1986 erosion levels ranging from 42 percent to 140 percent above natural levels. Several other watersheds fall within this range of values, but have not experienced the same readily observable problems. Most of these watersheds, however, have individual subdrainages in which sediment related effects have occurred. Many of the alternatives, including the Preferred, state in their goal statements that soil and water resources will be managed to meet Minimum Management Requirements. We recommend that you manage soil and water resources to exceed MMR and emphasize improvements for these resources in the proposed Preferred Alternative.

B. Review of Water Quality Monitoring Plans

The proposed Plan addresses the issue of monitoring and evaluation of management activities on various resources including soil, water, fish and cumulative effects. We agree with the approaches displayed in the Plan. However, we do have concerns for what is proposed and the need to improve the approach to be most effective.

1. The goal of a monitoring program to protect the water resource should be to assess the changing water quality conditions, not assessment of BMP implementation. The BMPs are tools to achieve water goals and should be monitored for their effectiveness to achieve water quality protection. However, BMPs are not the end products. Good water quality is the end product and, therefore, should be the focus of monitoring.

   We suggest the forest staff use the Nez Perce National Forest final plan, Appendix A, Forest Fishery/Water Quality Direction by Prescription Watershed approach and specific elements as a starting point for improving the Willamette monitoring plan. Please pay particular attention to the focus on beneficial uses of water in the streams and to the stream and water quality parameters monitored.

2. It is unclear in the proposed Plan how the results of the water monitoring efforts will be displayed to the resource managers to modify their management strategies as necessary.

A more frequent contact with the resource managers is necessary to ensure timely and effective decisions to protect water quality. We suggest that the plan be improved to show: (a) the mechanism for the results of water quality monitoring to be transmitted to other resource managers and (b) how frequently these communications will be made.

3. Adequate and guaranteed funding of a monitoring program is necessary. The proposed plan displays costs for monitoring, but this does not ensure that the monitoring will actually take place. It is our position that plan implementation monitoring is not voluntary or optional, but mandatory. Our position is based on the monitoring requirements inherent in the National Forest Management Act (NFMA) which states, "(E) insure that timber will be harvested from National Forest System lands only where -

   (iii) protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat" (Section 6, NFMA).

4. The forest staff should be commended on their in-depth assessment of environmental consequences of the alternatives on water/soil- Chapter IV of the Draft Environmental Impact Statement (DEIS). Recent studies referenced throughout the discussions are some of the most up-to-date and meaningful we have encountered.

   However, we feel the impacts presented here are not adequately handled by the water quality monitoring plans (Chapter V of the Forest Plan). We would recommend Class III and IV streams receive monitoring to help prevent cumulative effects on Class I and II streams. Most of the harvest and roading activities are in subdrainages with small perennial and intermittent streams. Much of the upper drainages have potential for severe surface erosion. This was identified in the discussion on Roadless Areas in Appendix C of Appendices - DEIS. One would assume these areas are representative of other upper drainages throughout the forest.

C. Review of Management Strategies and Alternatives

The DEQ made no attempt to determine a preferred alternative for water quality. We recognize that this is a land management plan, so we are concerned with the various levels of potential water quality impacts from those land activities. We also recognize that differences in management intensity of an activity will create varying potential impacts on water quality.

We reviewed all alternatives and management strategies and prescriptions found in the Plan and DEIS with interest in the potential for water quality impacts and the opportunities available to ensure water quality protection. We assume that the higher the level of soil disturbance by activities the greater the potential for erosion problems; also the greater the encouragement for recreation, the greater the potential for additional water quality problems.

If the proposed preferred plan alternative can maintain or improve water quality, then the DEQ could support the preferred alternative. However, we are not convinced from what we have been presented for review that this goal can be fully achieved.

The Plan and DEIS, as written, present problems for the reader to compare management alternative impacts on water quality on the following discussion areas:

1. The DEIS page II-30 mentions that "Techniques for meeting riparian requirements were also the primary means of meeting water quality requirements". Granted, each is affected by the other, but we feel that adjacent harvest and roading activity, past, present and future, play an equal, if not greater, role on water quality. This is particularly true with regards to sedimentation.

2. With regards to the Preferred Alternative (J), water was not part of the focus on major issues. Yet during the issue development survey, concerns for water quality received the second highest rating. The attention given to this issue was not given major focus in many of the alternatives. Please give it the attention the survey intended for it with regards to concerns and opportunities as was given the other major issues.

D. Review of Standards and Guidelines for Soil, Water and Riparian Areas (Chapter IV, page IV-60 - Forest Plan)

- All prescriptions are contained in Section B - Specific Standards/Guidelines. Management Area prescriptions reference Section B with regards to water, soil and riparian standards. This seemed cumbersome and somewhat confusing. This could be clarified with a Riparian Management Area prescription.

- Section B #3 describes minimum boundaries for riparian area as being approximately 100 feet from the edge of perennial streams, etc... Does this exclude intermittent (Class IV) streams?

- Section B #5. "Limit the mass failure rate on a given project area... to a rate that is less than twice the weighted average of the natural rates, etc..." This approach seems to be after-the-fact. How does one limit mass failure? The limitations should be on activities that may cause mass failure.

- Section B #10. appears to subscribe to activities that may deteriorate Class III and IV streams as long as water quality in Class I and II streams is maintained. Is this not inviting a problem?

- Section B #12. "... Where adverse effects are anticipated, they will be formally declared with notification to the public." This approach appears to condone adverse activities to a certain extent.

- Section B #13a. Does this mean there will be roading activities permitted that will increase sedimentation to the point of damaging water quality?

E. Review of the Plan for Groundwater Quality Protection.

The Plan virtually ignores the groundwater component of the hydrologic cycle. Although groundwater probably will be minimally affected by forest management activities, the Plan should recognize the importance of groundwater quality protection and discuss the following points.

1. Activities that affect groundwater quality will eventually affect surface water quality. Conversely, changes in surface water quality might be reflected in groundwater quality.

2. Lakes with unique pristine water quality may need special groundwater protection requirements to prevent nutrient enrichment, particularly with regard to sewage disposal practices associated with intensive recreational use.

3. All sewage disposal practices need to be in compliance with state requirements. Please state those requirements by reference in the Plan.

4. Groundwater protection planning should be included in all chemical handling practices, in the forest. This would include, but not be limited to herbicides, pesticides, fertilizers, and degreasing solvents at maintenance shops.

5. Activities and procedures that minimize erosion, and surface water runoff also will increase infiltration, allowing for more stable year rounds stream flow.

For further information regarding Water Quality, contact John Jackson at 229-6035.

Table 1
Maximum Allowable Increases
(PSD Increments)
(Micrograms Per Cubic Meter)

Class I Areas

Pollutant	Annual	24-Hour	8-Hour	3-Hour
SO2	2.0	5.0		25.0
TSP	5.0	10.0		

Class II Areas

Pollutant	Annual	24-Hour	8-Hour	3-Hour
SO2	20.0	91.0		512.0
TSP	19.0	37.0		

Class III Areas

Pollutant	Annual	24-Hour	8-Hour	3-Hour
SO2	40.0	182.0		700.0
TSP	37.0	75.0		

Department of Fish and Wildlife
OFFICE OF THE DIRECTOR
506 SW MILL STREET, P.O. BOX 59, PORTLAND, OREGON 97207 PHONE (503) 229-5406

March 17, 1988

Mr. K. Norm Johnson
Resource Planning
Department of Forestry
2600 State St.
Salem, OR 97310

Dear Norm:

Enclosed is a copy of the Department's draft comments for the Willamette DEIS and Proposed plan. The Department is concerned with the proposed short rotation management on nearly 700,000 acres of the Forest. This strategy would have a significant adverse impact to habitat diversity on the Forest. The Department is also concerned with proposed fish habitat management and the lack of specific standards and guidelines.

Sincerely,

Randy Fisher
Director

rro
enclosure

DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT

Oregon Department of Fish and Wildlife Comments
on the Willamette National Forest
Draft Environmental Impact Statement and
Proposed Plan

April 18, 1988

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GENERAL COMMENTS

The Oregon Department of Fish and Wildlife (ODFW) congratulates the Willamette National Forest (Forest) on the completion of its Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan.

ODFW comments and recommendations are intended to be constructive and lead to positive results. They are based on ODFW understanding of the National Forest Management Act (NFMA), the clean Water Act, Executive Order 11990, and key provisions of he Wildlife Policy of the State of Oregon.

In March of 1985, ODFW presented the Forest with fish and wildlife habitat protection criteria for use in planning. The criteria set minimum standards felt necessary to meet the State of Oregon Wildlife Policy (Oregon Revised Statue [ORS] 496.012). The focus of ODFW recommendations is on implementing actions to meet those habitat protection criteria.

ODFW generally objects to departure alternatives because forest wildlife resources would be rapidly diminished by accelerated modification or loss of habitat. Departure timber harvesting risks the evenflow of recreational and commercial opportunities associated with fish and wildlife.

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ODFW objects to management that creates an extensive area of even-aged stands across the Forest. Under even-aged timber management, structural and vegetation diversity would be greatly simplified and it may be difficult to maintain the desired amounts of dead and down woody habitats. A mix of even-aged and uneven-aged timber management across the Forest would provide diversity necessary for the variety of wildlife inhabiting the Forest. The Forest is urged to mix harvest prescriptions among adjoining units and emphasize uneven-aged management in all timber types.

Evaluation of the planning documents was difficult due to the lack of:

1. A map displaying the distribution of plant communities and seral stages;
2. A map of range allotments and information on range condition and trend;
3. Information on plans for access and travel management to protect sources and meet big game hunter demands;
4. Proper identification of big game winter range capability areas;
5. Recognition of ODFW big game benchmarks;
6. Proper use of elk habitat effectiveness models and adherence to interagency agreed to definitions; and
7. Specific information on habitat conditions; most data was based on a forest-wide analysis which is of little or no value for habitat management purposes.

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OREGON DEPARTMENT OF FISH AND WILDLIFE CONCERNS AND RECOMMENDATIONS

ODFW considers its position on the amounts and condition of resources comprising or affecting fish and wildlife habitat to be realistic and reasonable. Recommendations consistent with this position are presented for:

1. Aquatic/Riparian Habitats
2. Big Game Habitat
3. Management Indicator Species
4. Access and Travel Management
5. Roadless Areas
6. Old Growth Habitat
7. Dead Tree Habitat
8. Habitat Diversity
9. High Elevation Forests
10. Standards and Guidelines
11. Monitoring

1. Aquatic/Riparian Habitats

The provisions for protecting and managing these resources are questionable. Provisions for stream surface shading, if any, are unclear. Class IV streams are afforded little or no protection unless in unstable areas. Five percent of the proposed timber harvest is planned from riparian areas, and since riparian areas represent five percent of the Forest, it therefore appears protection of riparian areas is inadequate.

Stream sedimentation or turbidity standards and guidelines are not specific and cannot be measured, such as those provided for water temperature. High water temperatures are recognized as a problem in several watersheds. The Forest preferred alternative must provide remedial actions to correct identified temperature and turbidity problems.

Many areas of the Forest have unstable soils and pose a high risk of debris torrents and mass soil failures. The Forest recognized that, due to these risks, some alternatives will reduce: (1) soil and channel stability, (2) water quality and, (3) input of large woody material. ODFW cannot support any alternative that would degrade aquatic habitats.

Because large woody debris is an essential component of the stream channels for dissipation of stream energy, channel and stream bank stability, and fish habitat, ODFW supports the Forest standard to maintain large, woody debris at 90 percent or more of the current level existing for any given stream or lake. This standard is appropriate for areas that have not been entered for timber harvest; however, for areas that have been entered, the standard needs to be "90 percent or more of potential large woody debris."

In order to assure a high level of maintenance and protection of riparian-dependent resources, ODFW recommends the Forest develop a riparian management strategy similar to the Supplemental Resource

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Strategy developed by the Siskiyou National Forest. This strategy would not allow programmed harvest within riparian zones or livestock grazing in areas that have a range condition rating less than "good."

ODFW supports the application of MA 9c and 9d to nonwilderness lakes; however, how the application of these strategies was determined is unclear. For example, all of the approximately 30 candidate lakes in Blue River, McKenzie, and Rigdon Ranger Districts are assigned these prescriptions, yet none of twelve lakes on the Oakridge Ranger District are provided this protection. ODFW strongly recommends all nonwilderness lakes be given MA 9c and/or 9d designations.

2. Big Game Habitat

The following recommendations are designed to meet ODFW benchmarks for black-tailed deer and Roosevelt elk, and would require additions to and modification of the proposed standards and guidelines for Management Area 11 (Scenic) and Management Area 14 (General Forest) classification. The deer and elk benchmarks can be met through increased production and distribution of quality forage and cover.

ODFW's deer and elk population planning benchmarks for the Forest amount to 6,200 wintering elk and 21,400 wintering deer (20 June 1980 report to Rod Canutt, Region Six). In 1987, elk and deer were at 60 and 83 percent of the benchmark, respectively. When wintering herds are at the benchmark level, adult elk and deer numbers allocated to Forest summer ranges amount to 5,700 elk and 24,500 deer. The DEIS and Plan need to acknowledge ODFW planning benchmarks and provide an alternative that assures maintenance of those levels without diminishing hunting opportunities.

The 1980 report to Region Six also provided ODFW's definition of west slope Cascades winter range upon a request for specific planning information:

> "All slopes below 3,500 feet within a 180° aspect between N.W.-S.E. true bearing" and "other specific wintering locations that could be outlined."

ODFW recommends the Forest use the above definition to identify winter range capability areas on all maps. ODFW will provide a map identifying and delineating specific wintering locations at higher elevations.

The desired level of big game forage production is based on the quality of the forage, the length of time sites produce forage, and the distribution of forage sites. Forage quality is determined by the species seeded and the application of appropriate fertilizers. Permanent forage sites should be established at a rate of 100 acres per year over the planning period. These permanent sites should be managed under the MA9b prescription for special habitats, and evaluated for effectiveness at the end of the planning period. The number of trees planted on clearcuts needs to be reduced by the Forest to prolong their production of quality

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forage. Well distributed clearcuts adjacent to optimum thermal cover should be enhanced for big game forage with seedings and fertilizer at a rate of 1,000 acres per year.

In addition to forage production, the standards and guidelines for big game need to address three cover types (hiding, thermal, optimal thermal) as defined in "Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington" (Brown 1985). Cover management objectives are tied directly to forage site management, since hiding and thermal cover are lost on clearcut areas, and thermal cover is reduced on thinned units. The relationship of forage areas to hiding and thermal cover should, therefore, meet the guidelines presented in Brown (1985). These guidelines would ensure adequate thermal cover was near planned thinned units, or postponement of thinning until elk hiding cover developed in the forage area. The guidelines also provide for visual barriers between openings and roads to reduce vehicle disturbance to deer and elk.

To stabilize cover and forage relationships over time in an attempt to meet deer and elk population benchmarks, ODFW recommends the Forest's final plan set management direction to achieve evenflow controlled by acreage on the 1,000-6,000 acre permanent resource scheduling areas (RSA's) on timber management lands. RSA boundaries must not overlap adjacent unavailable or unsuitable lands by more than one-quarter mile. Ten-year harvest dispersion on the RSA's would be dictated by existing conditions, and stability would be attained with an average harvest of 10-12 percent per decade in regulated forest units. To maintain appropriate forage and cover relationships, clearcuts should not exceed 40 acres per block, with 5-20 acres preferred. Hiding cover succession criteria on created clearings should be changed to 10 foot tall trees, accounting for slope.

The RSA should also be the habitat effectiveness (HE) monitoring unit, involving all HE attributes (including roads), along with project area evaluations. To achieve desired big game outputs, the goal by RSA should be at least 0.5 HE and at least .75 on the forage quality attribute. The Forest must use "A Model to Evaluate Elk Habitat in Western Oregon" (Wisdom 1986) in forest management and planning, as agreed upon by USFS, BLM, and ODFW.

3. Management Indicator Species

ODFW is concerned with the proposed management strategies for management indicator species (MIS) and offers the following recommendations are to resolve those concerns:

Spotted Owls

The Forest is the most important area within the range of the northern spotted owl due to its size, central location, and amount of occupied habitat. Every effort needs to be made to provide the best remaining habitat and distribution pattern. Based on research conducted on the

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Willamette and elsewhere, ODFW recommends at least 2,200 acres of old-growth/mature forests be maintained for each selected pair.

As a result of the risk analysis conducted by Region 6 USFS for the spotted owl SEIS and current thought on island biographic theory, ODFW continues to support management of existing large blocks of contiguous, suitable habitat to maintain the spotted owl and associated species over the long term. Large block areas would include multiple pairs of owls and replacement habitat.

Using the Region 6 MMR distance guidelines for single pair SOHA's, ODFW concludes that at least 19 additional SOHA's are needed to fill gaps between SOHA's identified in Alternative J, particularly those providing connection to adjacent BLM lands and other national forests. These include both occupied and capable (future) spotted owl habitat areas (SOHA). Recommended additional SOHA's are listed below:

A. To Connect to BLM SOHA's

1. Elkhorn (AQ)
2. Moose Creek (EJ)
3. Moose Creek (EJ)
4. Cone Creek (MI)

B. To Connect With Adjacent Forests

1. Potato Hill (IA)
2. Paddy's Valley (3H)
3. Dome Rock (3E)

C. To Improve Distribution Within the Forest

1. Tidbuck Creek (MB)
2. Brush Creek (RB)
3. Cabin Creek (RF)
4. Cayuse Creek (ZE)
5. Warm Springs (ZD)
6. Cedar Creek (ZG)
7. Fuji-Marilyn (ZV)
8. Wolf-Hills (3R)

D. Capable SOHA's (approximate locations)

1. T11S, R6E, S.36
2. T13S, R4E, S.30
3. T15S, R4E, S.06
4. T15S, R7E, S.15
5. T23S, R4E, S.26

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Pileated Woodpecker

Based on recent work by Mellen (1987, M.S. Thesis, OSU), and Brown (1985), ODFW recommends guidelines be changed to provide at least 500 acres of mature and old-growth forest habitat for nesting and roosting habitat. Potential nest trees should average 28 inches dbh. Foraging habitat should also be increased to at least 500 acres with two snags (17 inch or larger dbh) per acre to meet minimum needs of other primary cavity excavators. Habitat blocks should be contiguous. Additional comments are provided under Standards and Guidelines.

Pine Marten

Pine Marten populations will suffer if habitat areas are isolated from one another by extensive stands of unsuitable habitat. ODFW recommends maintaining forested corridors and streamside buffers with high levels of down logs as travelways throughout higher elevation forests. (See comments for high elevation forests).

Other

ODFW recommends the Forest select a management indicator species for riparian habitats and resident fish habitat. ODFW will work with the Forest to identify these species.

4. Access and Travel Management

The Forest is required (FSM 4/87 R-6 Supp. 40 2635.02) to develop a comprehensive road management plan that includes fish and wildlife objectives, and coordination with ODFW. Through this process ODFW will provide specific input for desired open road densities on the Forest. The Forest must use federal authorizations to address vehicle use restrictions of roads and areas in the Land and Resource Management Plan (FSM 7110, FSM 2355.1).

Seasonal management of motorized travel is needed to assure habitat effectiveness on summer range and protection on critical winter range, to protect special habitats (e.g. calving meadows), and to improve buck and bull escapement. During statewide elk management workshops in 1984, Oregon big game hunters identified forest roading as their foremost concern and favored increased road closures to resolve roading impacts. The Forest does not address this issue. The Forest needs to fully discuss the effects of open roads and open road density on big game. The Forest has approximately 232 miles of arterial, 1,815 miles of collector, and 4,317 miles of local roads - with plans to build 5,288 additional miles of roads. Because each mile of open road reduces habitat effectiveness ODFW's focus is on management of local roads and some collector roads.

ODFW recommends an average of 1.5 miles of open road per square mile of developed area. The Forest must find a way to effectively bar motorized traffic on closed roads.

Nonessential roads on winter range should not be open to motorized travel from December 1 to April 15 each year. Any areas where ORV activity conflicts with wintering big game would also require an area closure.

ODFW recommends closure to public vehicle use on all new road systems developed in the now existing unroaded areas. This direction would help meet habitat objectives for big game and would not allow a use pattern to develop.

In summary, the following need to be implemented in the Forest's comprehensive road management plan:

1. Establish an average open road density not to exceed 1.5 miles per square mile of developed area;
2. Eliminate all motorized travel in area closures;
3. Establish special seasonal closures on big game winter ranger areas;
4. Screen forage areas from roadsides;
5. Emphasize year-round closures; and
6. Agree (ODFW and Forest) on definition of a "closed road."

ODFW recommends the Forest summarize the road management plan and include large scale maps in the final environmental impact statement.

5. Roadless Areas

ODFW supports the proposed allocation of roadless areas in Alternative J for:

Bull of the Woods	Mt. Hagen
Menagerie	McLennen Mountain
Mt. Washington (North)	Waldo Lake
Mt. Washington (South)	Charlton Butte
Huckleberry	Maiden Peak
Frog Camp	Bulldog Rock
Gold Creek	Diamond Peak (North)
Rainbow Falls	Diamond Peak (South)
French Pete (A and B)	

The Forest needs to manage the Maiden Peak and Hardesty Mountain roadless areas with a strategy (MA 10e or equivalent) to protect the SOHA's in these areas.

ODFW recommends a dispersed recreation allocation for the following roadless areas:

	MA		MA
Opal Creek	10e	Roaring River	10d
Elkhorn	10e	Chucksney Mountain	9a,b/10e/10d
Mount Jefferson North	10d	Waldo-Fuji	10e/10d
Mount Jefferson South	10d	Waldo-Salmon Creek	10e
Middle Santiam	10b	Waldo-Many Prairies	9a

Echo Mountain	10d	Waldo-Koch	10d
Moose Lake	10b	Waldo-Moolack	10e
Gordon Meadows	10d	Cornpatch	9b/10d
Mt. Washington West	10d	Hardesty Mountain	10b/10e
Mosquito Creek	10e		

Site-specific recommendations for each roadless area are found in comments to DEIS Appendix C.

The management of those areas recommended for dispersed recreation strategies would help meet the wildlife policy of the State of Oregon by providing for optimum fish and wildlife recreational and aesthetic benefits for present and future generations of the citizens of the State.

Roadless areas respond in part to those big game hunters who identified forest roading as number one of 32 concerns expressed at statewide workshops. In addition, water quality is better within roadless areas and nonroaded areas help provide bull and buck escapement while maintaining the hunting opportunity. Roadless areas also provide natural habitat diversity and solitude for a variety of nongame species.

6. Old-Growth Habitat

ODFW has two concerns with the proposed old-growth habitat management on the Forest: (1) the lack of proper distribution of these habitats, particularly at lower elevations, and (2) the amount of old growth by plant community. ODFW habitat protection criteria for forested lands is met where "A minimum of 5-15 percent of each major plant community on the forest is dedicated old-growth stands, well distributed by slope, aspect, and elevation throughout the forest." The Forest needs to display the amount and location of current old-growth habitats by plant communities, since ODFW cannot determine if this criteria is met based on the information provided in the DEIS.

Old-growth habitats are important for the production and stability of watersheds and many plant and animal species.

The Forest should follow the habitat definitions from "Regional Guide for the Pacific Northwest Region" when identifying old-growth habitat acreage by plant community.

7. Dead and Down Woody Habitat

ODFW recommends the Forest adopt a minimum snag policy of 60 percent potential population level for the general forest allocations (MA-14), and a 100 percent level for all other allocations to meet ODFW protection criteria. Areas of past management activity or firewood cutting with less than 60 percent of potential population snag levels should be surrounded by an area of equivalent size that is managed at the 100% level.

ODFW is not aware of any coordinated monitoring of snag habitat on the Forest. Observations by ODFW biologists indicate an insufficient number and variety of snags has been retained on past logging sites to maintain even minimum viable populations of cavity nesting species on managed forest areas. These inadequate snag management efforts of the past must be rectified through this current planning process.

It is essential that hard snags of varying diameters and heights be provided to maintain populations of all species of cavity nesters. Where suitable snags are lacking, live trees should be designated for future snag management. Public education and enforcement against unlawful wood cutting and other destruction of wildlife trees should be a part of the snag management program. The Forest needs to display the methods that would be used to protect these habitats from management activities.

Management of primary cavity excavators at the 20-40 percent potential population level assumes that these animals can be concentrated in a lesser number of snags. This assumption does not adequately address the ecology of these species. The behavioral and territorial requirements of some animals would preclude occupancy of snags by others; therefore, ODFW recommends the Forest leave more wood in project areas. An increased amount of wood residue would increase habitats for nongame species and provide for increased nutrient recycling. Traditional practices, such as yarding unutilizable woody material, often leaves too little woody material on the site for nongame species. Guidelines for leaving more wood in project areas should follow Brown (1985).

8. Habitat Diversity

ODFW is concerned with the impact of the General Forest (MA 14) land allocation on the diversity of plant and animal species. Seral stage IV, as illustrated in Figure III-G-3 of the DEIS, approximates the rotation of the MA 14 prescription, and provides the least plant and animal diversity of the six stand conditions presented in Chapter III of the DEIS. With a typical 100 year rotation, 50 to 70 percent of the managed acres would be in seral state IV, and the remainder of the managed acres would be in lower successional stages.

The adverse impact of seral stage IV on plant and animal diversity is a direct result of a closed crown cover condition. The closed crown cover greatly reduces the amount of sunlight reaching the forest floor; this, in turn, reduces the production of understory vegetation.

Another impact of intensive timber management on plant and animal diversity is the reduced amount of time that regeneration units stay in the lower stand condition classes. Intensive management practices, such as vegetation control, decrease the duration of grass/forb and shrub stand conditions by one-half.

The Forest has used the amount of old-growth acres on a Forest-wide basis as an indicator of diversity, which is an unacceptable method of measurement. All six stand condition classes, and the habitat components of

each class (i.e., snags, down woody material, forage production), should be included in diversity measurements.

ODFW recommends the Forest: (1) re-evaluate habitat diversity and the consequences of the proposed alternatives and management strategies on that diversity, (2) redesign the MA 14 prescription to meet a much higher level of plant and animal diversity than currently proposed and, (3) provide a detailed map for the preferred alternative showing all management allocations. This effort must adhere to the intent of the following planning regulations:

36 CFR 219.26 (Diversity) states, "Inventories shall include quantitative data making possible the evaluation of diversity in terms of its prior and present condition. For each planning alternative, the interdisciplinary team shall consider how diversity will be affected by various mixes of resource outputs and uses, including proposed management practices. [Refer to 219.27(g)]

219.27(g) Diversity, "Reductions in diversity of plant and animal communities and tree species from that which would be expected in an natural forest, or from that similar to the existing diversity in the planning area, may be prescribed only where needed to meet overall multiple-use objectives."

The reduction of habitat diversity from implementing the MA 14 strategy on nearly 700,000 acres of the Forest would be the result of a prescription designed to meet a single-use objective. Planning regulation 36 CFR 219.27(g) states "Reductions in diversity . . . may be prescribed only where needed to meet overall multiple-use objectives."

9. High Elevation Forests

ODFW is concerned with the proposed management strategies for high-elevation forests, such as the mountain hemlock/lodgepole pine working group and with associated species. Resident wintering wildlife associated with these high elevation habitats are adversely affected by openings. Current literature indicates these habitat types: 1) produce poor quality timber; 2) have the lowest average volume per acre; 3) have the lowest market value; 4) are expensive to harvest; 5) experience extremely slow height and diameter growth; and 6) are extremely difficult to regenerate. The last two points are of concern to ODFW because proven regeneration difficulties and slow growth significantly increase the length of time these high elevation forests are in an open condition.

The amount of information about and experience in managing these habitats is limited. There is a need for both agencies to fill the information void that exists regarding the management of the high elevation forests. Therefore, ODFW recommends no programmed harvest for the high-elevation forests during this planning period. When better information is available, an informed management decision could be made concerning the disposition of these habitats.

10. Standards and Guidelines

The Regional Office briefed ODFW on Forest Planning on 15 November 1984, at which time a document titled "Forest Plan Contents (1982, USDA Forest Service)" was explained. A reference from page 10 of the above document states:

> "Standards and guidelines state the bounds or constraints within which all practices will be carried out in achieving the planned objectives. Therefore, standards and guidelines should be measurable to be meaningful. There is little purpose in defining standards and guidelines for which no methods of measuring the degree of compliance or attainment exist."

ODFW recommends development of a strong set of specific standards for the Plan. By definition, a standard is a point to measure against or a basis for comparison. The qualifiers used (such as some, sufficient, where needed, significant, should, etc.) are subjective and do not allow for comparison. The Forest must develop clear and objective standards which would provide guidance for implementing the final plan. Toward this end, ODFW recommends the Forest use the definitions (below) developed by the Siskiyou National Forest for four of the most often used terms. In addition, the Willamette National Forest would need to define other terms used in the standards and guidelines that can be subjective in nature.

> "The type of direction and degree of restriction are identified by the terminology in the Standards and Guidelines. To understand the intent of the direction, the interpretations of the terms used are critical.
>
> "The first intent is conveyed by the word 'shall.' With this degree of restriction the action is mandatory in all cases.
>
> "The second is conveyed by the word 'should.' With this degree of restriction, action is required, unless justifiable reason exists for not taking action. This direction is intended to require a practice unless it entails unacceptable hardship or expense. Exceptions to "should" restrictions are expected to occur infrequently.
>
> "The third type of direction uses the word 'practicable' and acknowledges that a given practice is not always feasible and practical in every situation. It is intended to encourage, but not require, a practice.
>
> "The fourth uses the word 'may' and has to do with activities which may or may not be appropriate, depending on circumstances. For example, grazing may be consistent with the objectives of certain management areas, but

> specific sites may or may not contain suitable forage. This direction is intended to allow for taking advantage of compatible opportunities, or to provide for exceptions when objectives of a particular standard can be met through alternate methods."

An established set of standards would lead to more consistent management across the Forest. For this reason, ODFW recommends the use of more specific standards in the final plan.

11. Monitoring

ODFW considers most of the species and habitat monitoring programs proposed in the Forest Plan inadequate due to the low reliability of the results. Because the Plan deals with theoretical minimum level populations, a high level of monitoring reliability is necessary; therefore, monitoring methods must be detailed so reviewers can assess the reliability of the results.

ODFW recommends modification of monitoring methods to obtain a high level of reliability. The use of an index figure is an inadequate monitoring scheme for primary cavity excavator populations. Instead, snag retention (hard and soft) and dead and down material should be monitored annually in units not to exceed 80 acres. A method needs to be developed to monitor pine marten population trends and should be agreed to by ODFW. Elk populations should be monitored using Wisdom's Habitat Effectiveness Model.

Fish and wildlife monitoring activities should be conducted through a cooperative effort between ODFW and the Forest. ODFW recommends the Forest consider development of a cooperative position with our Northwest Regional Office for the purpose of conducting most of the fish and wildlife monitoring activities.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT

PURPOSE AND NEED (DEIS CHAPTER I)

P.I-16 Water

The paragraph appears overly optimistic and conflicts with the cumulative effects information listed in Chapter IV of the DEIS.

P.I-19 Wildlife, Fish, and Plant Habitat

In this discussion, the Forest failed to mention the impacts of timber harvest on old-growth and snag-dependent species. The Forest needs to state that old-growth stands provide available forage during the winter when harvested areas are covered with snow.

ALTERNATIVES (DEIS CHAPTER II)

P.II-19 The discussion of alternatives considered but eliminated is well done.

P.II-31 Paragraph 3

The Forest has presented a good discussion of how minimum management requirements (MMR's) act on present net value; however, ODFW believes MMR's should be considered as methods to produce and protect resource values, not as "constraints."

P.II-33 Mitigation Measures

"Rectifying by repairing" and "compensation by replacement" or "substitute resources" are considered by ODFW to be low priority or the least acceptable of the measures listed. The option of not taking a habitat degrading action is generally more cost effective than mitigation after the fact. Seeding to improve big game forage is a proven mitigation measure on cutover forestland in the Coast Range. The Forest needs to consider the use of these forage enhancement techniques.

In addition, the Forest needs to establish protection measures for wildlife trees in timber sale areas and test the effectiveness of building nest structures.

P.II-36 Threatened, Endangered and Sensitive Species

The Forest needs to include the bald eagle in this discussion.

P.II-37 Alternatives C, D, and F appear to be the only ones that will meet or exceed ODFW requirements for dead and down woody material on harvested acres. Only Alternatives C and D will meet riparian and lakeside protection guidelines, but Alternatives C, D, and F will meet buffers around meadows, talus, cliffs, and caves. None of the

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alternatives meet current ODFW guidelines for spotted owls. Only Alternatives C, D, and F maintain some optimum thermal cover for elk, and provide for forage enhancement.

All the alternatives suggest that roads may be closed to protect threatened and endangered species, and deer and elk winter range. These are good reasons; however, closures are also needed to mitigate a loss of cover when high road densities exist, and when access creates undue disturbance or resource overuse.

P.II-48 Alternative C goal statement for fish and wildlife is good.

P.II-49 Alternative C and D

(d) Fish and Wildlife

These two alternatives offer the only comments on forest-wide optimal thermal cover on winter range. Optimal thermal cover is a key habitat component on summer range as well. ODFW recommends the Forest provide an alternative with adequate forest-wide optimum thermal cover.

P.II-52 Alternative D - Goal statement to provide for fish and wildlife resources above MMR level is good.

P.II-56 Bottom of page

The specified ten percent harvest rate near lakes and reservoirs recognizes ODFW concerns; however, application of prescriptions 9c and 9d are preferred.

P.II-59 Alternative I will not meet ODFW criteria, since fish, wildlife, soil, and water resources would be managed at minimum levels.

P.II-62 Alternative J

Like Alternative I, Alternative J does not meet ODFW habitat protection criteria. This alternative displays four options for timber management; however, the consequences of each option on other resources is not discussed in Chapter IV.

P.II-66 (d) Fish and Wildlife

"Big game habitat will be maintained at current levels with proper forage and cover on key ranges." There is no definition of "key ranges" or where they are located. The Forest needs to explain how big game habitat will be maintained at current levels with proposed increases in harvest levels. The Forest assumes a direct relationship exists between big game numbers and amount of forage areas. This assumption is not valid, as other factors of habitat effectiveness would act to suppress this increase.

Habitat manipulation projects in Alternatives J and J Departure (d) Fish and Wildlife, para 6, sentence 2. "Habitat manipulation projects will be undertaken to improve habitat for key species." The Forest needs to define "key species."

P.II-104 d. Water

ODFW finds the harvest rate indicated in Figure II-E-15 and acres suitable is unreasonably high considering that 39 percent of the adjacent areas have already been impacted.

P.II-105 The Forest does not explain the methods and accuracy of the smolt modeling. The enhancement projects listed are largely influenced and controlled by agencies other than the U.S. Forest Service.

P.II-109 Bald Eagle Habitat

ODFW recommends provision be made for replacement habitats if some are lost due to blowdown or fire.

P.II-110 (5) Deer and Elk

The Forest's discussion on habitat capability for deer and elk is incomplete. The arrangement and quality of cover and forage areas, and impacts from open roads all determine how animals will survive on winter range.

The Forest has mixed the use of the terms "thermal cover" and "optimum thermal cover." The Forest needs to consistently use each term where appropriate.

P.II-115 J. Recreation

ODFW finds no options to mitigate the fifth decade failure to meet dispersed hunting and fishing recreation demand.

P.II-119 Figure II-E-27a

The Forest shows a different local road construction figure in the Proposed Plan Figure IV-D-1. Which is correct?

P.II-120 Figure II-E-27b

Why do big game WFUD's in Alternative J increase over Alternative A, while the elk and deer population trend index in "J" generally decreases or remains stable when compared to "A?"

P.II-121 Figure II-E-27b

The outputs displayed for Primary Cavity Excavators are misleading. The outputs are derived by averaging forest-wide snag levels, which tends to mask serious impacts on some managed timber lands. The

outputs need to be developed on a subwatershed basis on timber management.

The outputs for old growth are misleading because seral stage V (mature) acres are included in the figure. Seral stage V and IV need to be displayed separately.

P.II-128 Figure II-E-29

In this Figure and related narrative, expected differences in water quality, by alternative, are poorly documented except for expected erosion rates. Water quality MMR's are listed as either "met" or "exceeded." The Forest needs to describe the magnitude of these differences by alternative.

AFFECTED ENVIRONMENT (DEIS CHAPTER III)

P.III-11 2. Current Situation

Good recognition of reduced soil productivity from the loss of large woody material. Entire discussion of the Current Situation on pages III-11 and III-12 is good.

P.III-17 2. Current Condition (paragraph 2)

The breakdown and display of stream mileage by class is good. However, this is one of the few mentions made of class IV streams. ODFW recommends class IV stream information be recognized throughout the riparian and water quality sections. On page DEIS I-7, the Forest states "...more than 2,700 miles of perennial streams and rivers." Which page (I-7 or III-17) has the correct figures?

P.III-22 Figure III-E-4

The Forest should show hatchery water use from Quartzville, Middle Santiam, and South Santiam Rivers. The Blue River and McKenzie watersheds also influence hatchery waters.

P.III-24 Figure III-E-5

How does Brownsville use the South Santiam River for a municipal water source?

P.III-25 Paragraph 3

"Willamette" and "Oakridge" are now a single hatchery.

Paragraph 4

The annual generation of $17,359,000 by water oriented recreation is good recognition of a resource value by the Forest.

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P.III-26 c. Water Quality (Paragraph 2)

Why is lake and reservoir water quality "of lesser concern" than streams quality? Hills Creek Reservoir and Waldo Lake are examples of high concerns for water quality.

P.III-28 Paragraph 1

The state water quality standard for temperature is recognized and stated. The Forest needs to display other state water quality standards.

Paragraph 2

Are the high temperatures mentioned a result of natural conditions or Forest management activities?

Paragraph 3

ODFW recognizes Quartzville Creek, and Middle and South Santiam Rivers as streams where maximum water temperatures can also be critical, and watershed canopy protection should be emphasized.

Last Paragraph

Oregon water quality standards (Oregon Administrative Rules [OAR], Chapter 340) measured as turbidity are stated, but measurable limits are not shown. These standards need to be displayed.

P.III-29 Paragraph 3

"In the 26 major watersheds on the Forest, current erosion and sediment production are well above natural levels." How far above natural levels? Do they exceed OAR Chapter 340 limits?

P.III-30 Paragraph 6

The Forest states "...most streams and rivers on the forest are considered to be deficient in large woody debris...." How would continued harvesting in riparian areas in the next decade impact this important component of stream stability?

P.III-31 Figure III-E-8

How does the data in this Table compare to Oregon Stream Turbidity Standards?

P.III-47 Figure III-G-4

This is an excellent display of the interrelationships between stand conditions and habitat components.

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P.III-48 Riparian Zones

The discussion and recognition of conflicts are good.

Figure III-G-5

Class I, II, and III stream miles in this table differ from those on page III-17 (paragraph 7). Which figures are correct?

P.III-51 3. Old-growth (Paragraph 1)

The Forest should state how much of the existing old growth is in wilderness; and how much old growth has been liquidated since the 1981 inventory. The Forest provided a good delineation of existing old-growth and large-mature acres. Continued discussions group these seral stages together, making it impossible to determine acres by the separate ages. The Forest needs to display the acres of each seral stage by plant community in a table format, and provide a small scale map that shows the distribution of these stands.

The Forest needs to discuss the importance of old growth in providing thermal cover and snow intercept values for big game.

P.III-52 Paragraph 1

In this discussion, the Forest makes no mention of the structural component of multi-layering which is so characteristic of old-growth habitats. Multi-layering allows for snow intercept and improved thermal cover values for wildlife, especially deer and elk.

Old-growth stands, through snow intercept, provide an area where shrubs are often available for browse. In addition, lichens falling from trees are a very important food in old-growth stands during critical winter periods.

P.III-58 Future Trends (Paragraph 1)

The Forest should include protection of wildlife values as a resource objective.

P.III-61 Figure III-1-2

In view of recent ODFW data precluding re-establishment of winter steelhead above Green Peter Dam, the Forest should subtract 18.2 miles of potential anadromous fish habitat from the South Santiam River.

P.III-62 Paragraph 6

The Forest should display the data supporting the statement that the overall supply of native resident cold water fish has not changed significantly.

Paragraph 7

ODFW does not stock all lakes accessed by roads with both legal-sized trout and salmon.

P.III-63 2. Current Situation (Paragraph 1)

Change sentence 2 to read: "These include native species of spring chinook, winter steelhead, rainbow trout, cutthroat trout, bull trout, and mountain whitefish, as well as introduced species of summer steelhead, brook trout, brown trout, and sockeye salmon that have become naturalized."

Figure III-1-3

Correct the "Table of Anadromous Fish Spawning Populations" to read:

Drainages	Spring Chinook	Summer Steelhead	Winter Steelhead
Little North Santiam[a]	50	30	50
South Santiam River[a]	0	0	300
Quartzville Creek[a]	0	0	0

[a] In USFS ownership only.

Last Paragraph (Sentence 3)

Correct to read: "Fish reared in the Santiam, McKenzie, and Middle Willamette watersheds account for 80 percent of the average annual catch of 15,000 fish."

P.III-64 Paragraph 4

ODFW believes instream enhancement structures are often worthwhile projects, but the costs/benefits for increasing trout production may not always be feasible.

Paragraph 5

ODFW stocks lakes one-acre or larger in size. Helicopter stocking of remote lakes is conducted every other year. West slope cutthroat trout are being used experimentally with some success.

P.III-65 Figure III-1-4

Add spring chinook species as present in Detroit Reservoir.

P.III-66 Paragraph 2

ODFW is not placing spring chinook above Foster Dam; therefore, fish passage improvement at Foster Dam would have no bearing on increasing spring chinook populations in the Willamette River.

Paragraph 3

ODFW considers fish passage improvements at Foster and Green Peter Dams to be of questionable value. The Forest implication that fish passage improvements are all that is needed to increase anadromous fish production is in error.

P.III-69 Historical Trends

The Forest needs to discuss historical trends for deer and elk.

P.III-71 Old-growth and Mature Conifer Habitat

The Forest needs to recognize that these habitats also provide food and cover for MIS during winter. In all but the most mild winters, ODFW considers old growth to be a critical habitat.

P.III-73 MIS: Spotted Owl

This discussion is very well done.

P.III-74 Pileated Woodpecker (Paragraph 1)

The Forest states the average of a nest tree diameter for pileated woodpeckers is 25 inches. ODFW questions if habitat of this size would occur on lands designated for timber production in the future (100-150 years). ODFW recommends habitat for pileated woodpeckers be dedicated. (See Recommendations).

Pine Marten (Paragraph 4)

ODFW is concerned about the adequacy of the 160-acre habitat areas for pine marten. (See Recommendations).

P.III-75 Paragraph 4

The Forest states the existing habitat conditions for primary cavity excavators is 74 percent of potential populations according to standards in "Wildlife Habitats in Managed Forests, Blue Mountains" (Thomas 1979). ODFW recommends the capability be recalculated using "Management of Fish and Wildlife Habitats in Forests of Western Oregon and Washington" (Brown 1985), since this reference is more appropriate for westside forest communities. See comments for DEIS II-121.

Figure III-J-3

This figure does not provide usable information to determine current habitat conditions. The Forest needs to display percent of potential population level by subwatershed for each plant community.

P.III-76 Winter Range Habitat MIS: Deer and Elk

This section does not sufficiently address the big game resource issues; a number of statements are vague or misleading.

Paragraph 1

While deer and elk are dependent on winter range habitats, they are also dependent on summer range habitats and have special habitat needs during the spring and fall. The Forest needs to describe the condition and use of all habitats important to deer and elk. ODFW's 1987 estimates for wintering populations on the Forest were 3,700 for elk and 17,800 for deer.

The Forest needs to correctly acknowledge ODFW big game planning targets. The following information is provided for that purpose:

			Winter Targets			
			Unitwide		Forest	
Unit	Bulls/ 100 Cows	Bucks/ 100 Does	Elk	Deer	Elk	Deer
Santiam	7	25	5,900	51,600	4,600	21,100
McKenzie	7	25	4,500	37,000	4,200	14,500
Indigo	7	25	4,300	30,000	3,550	14,800
TOTALS			14,700	118,600	12,350	50,400

After seasonal emmigrations and immigrations, the expected numbers of adult elk and deer on the Forest in relation to the previous table are as follows:

	Summer On-Forest Benchmarks	
Unit	Adult Elk	Adult Deer
Santiam	5,000	25,700
McKenzie	3,250	16,500
Indigo	2,800	18,000
TOTALS	11,050	60,200

P.III-77 Figure III-J-4

This Figure is misleading in that it deals only with forage produced in the various stand conditions but does not specify wintertime availability. Since the discussion is about winter range, forage availability to wintering animals is important. Large sawtimber and old growth do not appear important in Figure III-J-4, when in reality these stands provide most of the available forage during severe winter months.

Paragraph 1

Sentence 1 needs to be clarified. Forage intake rates are not expected to change appreciably during winter months. Big game do require forage with a high energy content during winter months. The Forest has cited a study describing weight loss of wintering elk in Wyoming, but has not discussed the relationship of that study to elk in the Cascade Range. This relationship needs to be addressed.

Paragraph 2

See Recommendation section.

P.III-78 Paragraph 1

What is the condition of the thermal cover and optimal thermal cover components on the winter ranges? This information needs to be provided by subdrainages.

Paragraph 2

The Forest statement in parenthesis is misleading. These ratios need to be adhered to on a 1,000-6,000 acre permanent planning and record keeping area, as stated in ODFW's Habitat Protection criteria for deer and elk habitat.

Figure III-J-5

This Figure has little value as presented. A display of Forage/ Hiding/Thermal percentages on 1,000-6,000 acre winter range planning areas which represents individual winter range conditions would provide useable information.

Paragraph 4

In the first sentence, the Forest states that elk are found throughout the Forest. ODFW finds that an abundance of suitable elk habitat is currently unoccupied.

ODFW has not been supplementing the Forest elk population through transplanting since 1980, with the exception of a 1987 release of 11 elk on Lowell Ranger District.

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Paragraph 5

The statement that high quality and abundant forage has increased herd numbers to a point of conflict with adjacent landowners is not correct. Elk damage on adjacent lands does not result from an abundance of high quality forage on the forest; it is usually the result of the lack of cover, or too much disturbance on the forest.

Contrary to the Forest's statement, ODFW does not "road count" elk.

Last Paragraph

This paragraph needs to address deer as well as elk.

P.III-80 Future Trends

This section does not adequately describe the future trends for wildlife. The Fish and Wildlife standards and guidelines are, for the most part, designed to meet minimum viable population levels, not desirable levels.

P.III-89 Paragraph 1

The Forest should recognize hunting as an important recreational use of the forest.

P.III-93 Paragraph 6

ODFW does not believe Lost Lake experiences heavy boating use.

Paragraph 8

ODFW disagrees with the implication that some Ranger Districts are more important for hunting than others, and recommends this information be deleted.

P.III-118 Current Situation

ODFW finds no mention of its "McKenzie Subbasin Fish Management Plan" in this section. ODFW recommends the Forest recognize the plan. See recommendations.

P.III-145 Paragraph 2

The Forest needs to display the range of other multiple use values for individual roadless areas.

P.III-150 Future Trends

The future trends discussion for special interest areas is well done. It is especially good to see potential conflicts detailed.

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P.III-160 Current Situation

This discussion could apply to any National Forest in Region Six. The range allotment information specific to the Forest needs to be described (Refer to 36 CFR 219.20).

P.III-166 Figure III-V-1

How many miles of non-inventoried roads exist on the Forest?

P.III-169 Paragraph 1

The Forest needs to define the meaning of "closed road" and describe what activities can take place behind the closure.

(a) Wildlife - Closures

This is a good discussion and recognition of road closure benefits to wildlife. Add the following to the paragraph:

"Quality fishing is yet another reason to support some road closures. In some cases, road closures could be implemented to return some lakes to a hike-in experience, which would have the added benefit of reducing vandalism."

Future Trends

This section includes language to "complete the system" and discusses the "potential need for about 7,460 miles of road" (more miles than in Alternative J). Neither this nor other plan sections sufficiently stress the need to minimize road construction and encourage alternative harvest methods to improve protection of other forest resources.

P.III-180 Figure III-W-7

By lumping large saw/old-growth into a single category, the Forest creates the false impression that all of this timber is suitable for old-growth dependent species or old-growth set asides. ODFW recommends separation of these categories.

P.III-217 Paragraph 4

ODFW believes both commercial and sport fisheries are significantly affected by changes to fish habitat and water quality on the Forest. Commercial fisheries are affected along the lower Columbia; however, recreational effects are felt throughout the Forest's zone of influence, especially in the McKenzie and Santiam River systems.

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P.III-231 Other Influenced Areas

The Forest makes little mention of or emphasis on the value of the spring chinook and summer steelhead recreational fisheries under "other influence areas." ODFW considers these values especially important, particularly the spring chinook fishery on the Portland metropolitan stretch of the Willamette River.

ENVIRONMENTAL CONSEQUENCES (DEIS CHAPTER IV)

P.IV-3 Paragraph 6

The potential for instability and mass soil movement increases with increased timber harvest levels. How does this risk increase by alternatives, and does the Forest expect a proportionate increase in sediments?

P.IV-9 Figure IV-1-3

Sediment yields due to erosion, as shown in the figure, will have significant and lasting adverse effects on fish and other aquatic life.

P.IV-12 Figure IV-1-5

Alternative J permits removal of 11.7 percent of the harvest from potentially unstable soils. If 14,848 acres of unstable soils are harvested in the first decade, will timber yields from these acres be reduced in the future due to soil loss?

P.IV-13 Paragraph 5

Would draining unstable wet areas conflict with Executive Orders 11990 and 11988?

P.IV-16 Paragraph 4

The Forest recognizes that the smallest headwater streams are the most dependent on and most readily influenced by changes in associated riparian areas. ODFW finds little emphasis given to protection or recognition of these class IV streams.

P.IV-17 Paragraph 2, Sentence 1

Does the Forest have more current information available on the percentage of class I, II, and III streams adjacent to harvest units or roads? How many miles of class IV streams are affected?

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Paragraph 3

The Forest recognizes that most sediment from timber harvest enters from class III and IV streams. ODFW recommends these streams be given more protection in the final plan.

P.IV-18 The Forest makes no provision for restricted harvest along most class IV streams, even though these areas are identified in the text as a primary source of stream sedimentation. This oversight should be corrected.

P.IV-19 Effects of Sediment On Water (Paragraph 1)

The last sentence implies that a full discussion of sediment is given in Chapter III, Water. ODFW finds no disclosure of increased costs for water users located on or off the Forest as a result of sediment problems created by forest management activities.

P.IV-23 Paragraph 1

The Forest states mass wasting "...is the most significant in terms of potential impacts to water quality, fish habitat, and channel stability." What portion of erosion yields and stream sediment are a result of mass wasting resulting from natural as opposed to man caused disturbances?

Paragraph 3

Because of the loss of soil productivity, as well as reduction in water quality and fish habitat productivity, ODFW believes it is unrealistic to harvest timber from these potentially unstable acres. ODFW questions the use of the qualifier "potentially" in describing these areas. ODFW understands the probability of mass soil movement is very high and, therefore, recommends dropping the qualifier and withdrawing these acres from the timber base.

Figure IV-2-5

The Forest indicates the preferred alternative will have final harvest on more acres of potentially unstable soils than Alternative A (current direction). ODFW finds this contrary to the need to protect soils, water quality, and future productivity of the land base.

P.IV-25 Paragraph 2

ODFW finds discouraging the expressed need for increased water treatment due to greater turbidity, particularly in light of the Forest's mandate to meet the Clean Water Act and State Water Quality Standards. The Forest needs to develop better protection standards to ensure water quality is maintained or improved.

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P.IV-26 Paragraph 3

ODFW supports the development of the hydrologic recovery concept and its use for timber sale scheduling. Watershed sensitivity and hydrologic recovery rates should be incorporated into the water quality standards and guidelines.

P.IV-27 Figure IV-2-7

Alternative J has the same number of watersheds at risk as does the No Action Alternative, with ten of the twelve being in the high risk sensitivity areas. Quartzville Creek and Middle Santiam River watersheds influence hatchery water supplies and should be given greater consideration for protection.

P.IV-28 Paragraph 2

Alternative J's harvest level, which causes twelve watersheds to fall below threshold levels for hydrologic recovery, is an unacceptable risk.

P.IV-31 Cumulative Effects On Water

The cumulative effects section is well done; however, doubling the percent of the forest at risk of degraded water quality is contrary to direction given by NFMA, the Clean Water Act, Oregon Water Quality Standards, and ODFW criteria. ODFW suggests greater stream protection be provided.

P.IV-36 d. Mitigation Measures for Water

Paragraph 1

The agreement that BMP's satisfy the requirements of the Clean Water Act is misleading, according to a 1986 ruling by the Ninth Circuit Court. ODFW recommends the paragraph be re-written to reflect the requirement that the Forest meet water quality standards.

What are the costs and benefits of leaving large woody debris in streams as compared to the costs of installing gabions, log sills, etc.?

P.IV-51 Figure IV-4-1

If rotation age averages less than 80 years on approximately 700,000 acres (Alternative J), then vegetation and wildlife species diversity will be maintained at a very low level on about one-half of the Forest. See Recommendations.

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P.IV-57 Effects on Riparian Zones

Paragraph 2

All alternatives will meet the Forest's standards and guidelines for riparian areas, but those with higher rate of harvest will reduce soil and channel stability, water quality, and will result in less input of large woody material. ODFW finds standards and guidelines are inadequate, to maintain adequate soil and channel stability and large woody material levels. See Recommendations.

Paragraph 3

The Forest lists acres of riparian habitat by stream class and around lakes. Please explain criteria and process leading to the acre figures.

From 52,045 acres of riparian (Class I, II, III) 21 percent of these aces (13,600) are withdrawn to meet MMR's (Page IV-17) and 39 percent (20,280 acres) are already impacted (Page IV-17). This leaves 18,165 acres remaining to be harvested or programmed during the plan process. Are these the only acres figured into the various rates shown on Page IV-58, or are yields based on some other level?

If the Forest finds 30,438 acres of Class I and II riparian acres are in land suited for timber harvest, and 25,500 acres of Riparian I, II, and 19,500 acres of Riparian III are harvested, how does this relate to a 200 and 143 year rotation schedule?

P.IV-59 Cumulative Effects on Diversity

Paragraph 4

The Forest discussion of the effects on diversity emphasize age diversity and have ignored species diversity. ODFW believes intensive regeneration of Douglas-fir will have a detrimental effect on future vegetation species diversity. See Recommendations.

P.IV-61 (4) Cumulative Effects On Riparian Areas

The impacts to downstream areas from actions which alter temperatures, large woody debris input, sediment, and turbidity on class IV streams should be discussed.

P.IV-62 Paragraph 4

The impact on riparian habitat of maintaining only 60 percent of the existing cover along perennial streams should be discussed here. ODFW finds the 60 percent level unacceptable. See Recommendations.

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P.IV-71 MIS: Anadromous Fish

Since the elimination of fish passage barriers is under the control of other agencies, the probability of removal should be the same under all alternatives. ODFW finds the production of 800,000 smolts questionable. Fish production should be displayed by watershed. Smolt production will vary in relation to varying timber harvest levels.

P.IV-72 Paragraph 3

The Forest discusses eliminating fish passage barriers on the South Santiam River, yet downstream passage at Foster Dam is the real problem. Hauling adult fish around barriers has had little success. The pre-smolt release program above Green Peter Dam also has not been successful.

P.IV-72 Paragraph 5

The Forest needs to estimate the current habitat productivity of streams in relation to historic levels.

P.IV-73 Figure IV-6-1

ODFW finds this figure highly subjective, as it is based on broad assumptions regarding fish enhancement projects, some of which are under the jurisdiction of agencies not required to coordinate their activities with the Forest Plan Alternatives. Why do the two smolt levels differ so little between Alternative B-Departure and Alternative C when the amount of timber harvest is radically different?

P.IV-74 MIS: Resident Trout

ODFW does not agree that the majority of trout production occurs in reservoirs and wilderness lakes, or that in-stream production of trout is small. Reservoir trout populations are mostly hatchery oriented programs. This section should emphasize the significant numbers of wild trout produced in hundreds of miles of tributaries. With the emphasis on ODFW's Wild Fish Policy - these fish have high priority.

P.IV-75 Paragraph 2

The Forest refers to 1,335 acres of reservoir improvement which ODFW assumes are shoreline seeding projects. ODFW believes that this may improve water quality, but will do little to increase the trout fishery. What and where are the 118 acres of streamside improvement for trout?

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Cumulative Effects On Fish

Cumulative effects on fish should discuss the effect a continuation of current harvest rates or the preferred alternative will have on headwall failures, and impacts to class IV streams and downstream reaches.

Other Agency Plans

The final Forest Plan should acknowledge coordination with ODFW's McKenzie Subbasin, North Fork Willamette, Gold Lake, Lookout Point, Steelhead, and Trout Plans.

P.IV-76 Mitigation Measures

Paragraph 2

The Forest states K-V funds would be available in alternatives with high levels of timber harvest to mitigate for adverse conditions caused by timber sales and road construction. ODFW prefers to prevent adverse conditions so mitigation will not be necessary.

Paragraph 4

Does protection of vegetation within 100 feet of streams mean no harvest?

See Recommendations.

This section needs to describe past project successes or failures. The cost of leaving riparian areas or withdrawing them from timber harvest should be compared with the cost of rehabilitation and lost fish production.

P.IV-77 Paragraph 3

ODFW does not determine the level of fishing by issuing licenses.

P.IV-81 Paragraph 1

ODFW supports the withdrawal of SOHA's from the timber base.

P.IV-94 Paragraph 6

The assumption that snag habitat for primary cavity excavators will increase in the fourth decade is not valid. Thinning has generally removed cull trees and future snag habitat. Knowing this, it would be correct to predict further declines in snag habitat and snag-dependent species throughout the planning horizon.

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P.IV-96 Paragraph 4

This paragraph should acknowledge old-growth habitat also provides forage.

See Recommendations.

P.IV-101 Peregrine Falcon (Paragraph 3)

Vegetation manipulation (clearcuts) adjacent to nest sites may provide a greater forage base, but will have severe implications for visual buffers and protection of cliffs and talus slopes. ODFW recommends prescriptions for vegetation manipulation near nest sites as proposed in the Umpqua National Forest draft plan.

P.IV-103 Cumulative Effects on Wildlife

The Forest should discuss the cumulative impacts of roads on wildlife.

P.IV-104 Paragraph 3

ODFW spotted owl position statement signed by Director Jack Donaldson should be mentioned.

Paragraph 5

Good acknowledgement of ODFW criteria for primary cavity excavators.

Paragraph 6

ODFW's elk collaring objectives are not to determine population trends or herd composition, but to define animal movements, habitat use, and wintering areas.

P.IV-105 Mitigation Measures for Wildlife

The Forest needs to discuss road closure programs as a method to mitigate for areas of high road densities and insufficient cover. ODFW considers a road closure program as mitigation rather than enhancement.

Providing MMRs does not mitigate for lost habitat or the effects of intensive timber management. Managing any resource on public lands at a minimum level is not acceptable. Monitoring would track changes in habitat conditions as a result of management direction, but has little relationship to mitigation.

P.IV-106 Paragraph 6

The assumption that nest boxes can provide nest sites for cavity nesters is unlikely. Where is that being done successfully.?

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P.IV-130 Paragraph 1

The Forest has given excellent recognition of the impact of recreation in riparian areas. ODFW supports prohibiting camping within 100 feet of lakes and streams.

P.IV-139 ODFW recommends application of MA 6 prescription to that portion of the McKenzie River from the Forest boundary upstream to Clear Lake. This prescription is warranted to protect the high quality water, wild trout populations, and extensive recreation associated with this section of the river. Allocation of the river to the MA 6 prescription would complement ODFW's McKenzie River Subbasin Fish Management Plan, which designates most of the upper river for wild fish management. Many of the 51,000 recreational boating days identified in a 1983 ODFW river use survey originated in the upper McKenzie.

P.IV-152 Paragraph 1

The Forest should discuss the adverse effects of developing roadless areas.

P.IV-153 Other Agency Plans

ODFW sees potential conflicts in the development of roadless areas with the North Fork Willamette Plan and Trout Management Plan.

P.IV-154 Figure IV-13-2

Alternative J was developed to allow a slower rate of change in roadless areas; however, it still impacts two-thirds of the roadless areas and 50 percent of the land. ODFW recommends an aggressive road closure program as mitigation to reduce the severity of impacts.

P.IV-165 Paragraph 7

How many acres are removed from production for each mile of Arterial, Collector, and Local roads? The Forest needs to discuss the effects of the permanent loss of productivity from roads.

P.IV-169 Relationships With Other Agencies

The Forest should mention cooperative road closures with ODFW, and discuss the possibilities for or benefits from road closures. ODFW recommends the Forest discuss the benefits of an aggressive road closure policy on future habitat effectiveness and other resource uses.

P.IV-175 Figure IV-18-2

In the fifth decade, 10 percent or more of the harvest would come from commercial thinning in all alternatives. ODFW believes this practice would create undesireable impacts to forage/cover ratios, optimal thermal cover values, and overall habitat diversity.

P.IV-201 Paragraphs 2 and 3

The Forest states elk and deer numbers drop in decade one, then rise in decade two. Does the Forest assume natural population increases account for this change or is it due to changing habitat conditions?

P.IV-203 Relationships With Other Agency Plans

ODFW has adopted a Willamette Basin Fish Management Plan, a Trout Management Plan, several species and standing water body plans, and has an adopted McKenzie River Fish Management Plan. All of these plans are responsive to fish resources and socio-economic needs of the area. The new Forest Plan will have direct influence upon objectives in these ODFW plans, and the relationship between plans must be discussed.

P.IV-205 Paragraph 3

The Forest acknowledges increased erosion in major watersheds. The DEIS states landslides reduce the productivity of the site for many years, debris torrents in streams can reduce fish habitat productivity over many years, and some uses of land cause irretrievable loss of soil productivity. How does the Forest propose to protect soil and avoid damage?

P.IV-209 Paragraph 6

The Forest should recognize the value of winter range thermal cover for forage.

Paragraph 7

The Forest use of the word "temporary" is misleading. Research findings indicate silt loads from ground disturbance often have long-term effects (several decades) on fish production and other aquatic life.

APPENDICES TO

DRAFT ENVIRONMENTAL IMPACT STATEMENT

B-19 Big Game Winter Range

The winter range definition is not consistent with the definition ODFW provided in 1980 in response to a Region Six request.

ODFW recommends the Forest also use the definition for optimum thermal cover found in Brown (1985).

B-44 Figure B-C-4

This figure provides a good display of prescriptions and guidelines for each management prescription.

B-68 Wildlife Coefficients

The snag yield discussion is very difficult to follow. ODFW recommends the Forest develop a table or figure to display the snag coefficients.

B-70 Paragraph 1

Future roading densities are projected to exceed 3.3 miles of road per square mile in the secondary road category. This projected density would have the effect of reducing elk habitat effectiveness by nearly 70 percent. ODFW recommends closure to public vehicle use on all new road systems, particularly in current roadless areas. See Recommendations.

B-106 Paragraph 3

The Forest analysis of MMR for snags outside of areas dedicated to old-growth management used a snag size of 12 inches dbh or less. Data provided in Brown (1985) indicates only four species would use snags under 12 inches diameter. ODFW recommends the Forest consider larger snag sizes (up to 25 inches) to benefit approximately 35 more wildlife species.

B-172 Top of Page, Third Inset

The assumption that big game WFUDs are directly linked to big game habitat capability is not valid. ODFW has found that user days are influenced by many factors, such as economics, weather, season lengths, and bag limits.

B-192 Figure B-H-2

The Forest has provided an excellent display of tradeoffs of economic benefits.

APPENDIX C - ROADLESS AREAS

ODFW supports the Forest's proposed allocation of 19 roadless areas in Alternative J (see Recommendations). ODFW recommends the following for the remaining roadless areas:

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Opal Creek

Opal Lake and Creek should be retained in an undeveloped condition, since there is potential for a SPNM hunting and fishing experience. Opal Lake has a naturally producing brook trout population. Although isolated from major lake basins, it receives a fair amount of pressure. Recommend allocation to MA 10e.

Elkhorn

Both wild winter steelhead and cutthroat trout spawn and rear in Elkhorn Creek. Because of high erosion potential, ODFW recommends MA10e roadless designation primarily for watershed protection and SPNM hunting opportunities.

Mt. Jefferson North

This area is important spring, summer, and fall deer and elk range. ODFW recommends limited development under MA 10d on the basis of big game habitat and continued SPNM hunting opportunities.

Mt. Jefferson South

The Big Meadows area includes Pike and Fir Lakes, which get moderate angling pressure. ODFW recommends these lakes, as well as the North Santiam drainage, be allocated to MA10d. Some secondary access roads have already been constructed north and south of the lakes and should be closed. The area includes important foraging and calving areas for elk from spring through fall, and an important summer range for deer.

Middle Santiam

These areas have high potential for erosion which could degrade the water quality in Quartzville Creek and the Middle Santiam River. The Middle Santiam has already had major slides affecting water quality.

Daly, Don, and Riggs Lakes have self-sustaining trout populations receiving moderate use, and should be fully protected. Pyramid Creek and the Middle Santiam have wild trout angling opportunities, and provide a solitude type experience. Daly Lake would provide a more desirable recreational experience if the road wasn't so close to the lake. This area is big game winter range and should be managed as such; therefore, ODFW recommends allocation to MA 10b for this area with roads closed to public access.

Echo Mountain

This is a unique area that can easily be accessed from Highway 20. It has open meadows, peaks, and outstanding vistas. Crescent and Cougar Lakes both have self-sustaining brook trout populations, but North Peak Lake has proved too shallow to support fish. The meadows are an important foraging area heavily used by elk throughout spring, summer, and fall. ODFW recommends MA10d allocation for minimal development and maintenance of SPNM hunting opportunities.

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Moose Lake

Moose Lake and Creek are the main features of this area. Moose Creek is an important spawning and rearing area for native winter steelhead, and the watershed should receive high priority for water quality maintenance. This is big game winter range and should be managed as such. ODFW recommends the area be allocated MA10b with roads managed closed to public use.

Gordon Meadows

The two Gordon Lakes and the meadows are the main features of this area. The Lakes have self-sustaining cutthroat populations and are popular, with moderate angling pressure. A spur road now provides access within 1/4 mile of the lake. ODFW recommends MA10d allocation with provision for an extensive buffer zone around both the meadows and the lakes. This is an important spring, summer, and fall range for big game. ODFW recommends aggressive implementation of a road closure program in this area.

Mt. Washington West

This area is very popular with horsepackers and pack-in hunters, and is heavily used by summering elk and deer. ODFW recommends designation of this roadless area to MA10d, allowing some development but maintaining an SPNM hunting opportunities.

Mosquito Creek

This Horse Creek tributary, contiguous to the Three Sisters Wilderness, possesses an outstanding native cutthroat population in an essentially undisturbed watershed. The draft plan states "The area is made up of soils that are prone to severe surface erosion, droughty on south slopes, stable and may be locally low in fertility. There are about 256 acres (over half) that have potential for severe surface erosion." For these reasons, ODFW recommends protection under MA10e.

Roaring River

This area is used by hunters who have expressed concerns regarding roading in the area. ODFW recommends this area be allocated to MA10d to allow some harvest and maintenance of SPNM hunting opportunities.

Chucksney Mountain

This area has outstanding habitat diversity, including an extensive meadow complex on the ridge between Grasshopper Mountain and Chucksney Mountain. The area is very popular with hunters who use the extensive trail system. The higher elevations are used heavily by summering elk, and the lower south facing slopes along the North Fork by wintering elk. The Forest needs to protect the extensive meadows and the winter range on the southern slopes from Glade to Minute Creeks, and maintain the high quality SPNM hunting experience now provided.

ODFW supports allocation of the 9556 acres to MA10e as proposed in Alternative J, and further recommends the extensive meadow complex, along with a wide forest buffer, and the winter range habitat from Glade to Minute Creeks be designated as special wildlife habitat (MA9a/b). ODFW recommends the remaining areas be managed under MA 10d allocation.

Waldo-Fuji

The extensive meadows (Mt. David Douglas, Fuji Meadows, Pothole) should be designated as special wildlife habitat (MA9a). ODFW supports the Forest proposed allocation of 9,855 acres to MA10e and recommends all remaining areas be allocated to MA10d.

Waldo-Salmon Creek

ODFW recommends allocation to MA10e to retain the Ranger Creek SOHA to meet MMR distribution.

Waldo-Many Prairies

This area contains an extensive network of meadows along ridgetops and in wet areas, and it is used by elk during the spring and summer. The preferred alternative recognizes only North and Spring Prairies as special wildlife habitats (MA9a). ODFW recommends Captain Prairie, Salt Rock Prairie, Long Prairie, and Etta Prairie, along with an expansive no-cut buffer, also be designated as special wildlife habitats (MA9a). Devil's Lake is popular with anglers and should be allocated to MA9c. ODFW further recommends the Cayuse Creek SOHA be allocated to MA10e to meet MMR distribution, and the remaining area allocated to MA10d.

Waldo-Koch

This area is an important summer range for deer and elk, and a focal point for calving and fawning. ODFW recommends MA10e for the Cedar Creek SOHA to meet MMR distribution and allocation of the remaining area to MA10d to allow for improvement of habitat conditions.

Waldo-Moolack

This area includes parcels along Fisher Creek and the North Fork which are winter range for deer and elk. This 2-3 mile long area also fronts the North Fork Willamette River adjacent to the Waldo Wilderness; the upstream half straddles the lower end of the North Fork Trail. This river is an Oregon "Wild and Scenic" stream containing a healthy population of native rainbow and cutthroat trout. It is managed as a "wild trout" stream by ODFW.

Much of the roadless area contains large old-growth conifers, and the upper end adjoins a swamp encompassing several acres along the river. Because of its special fish resource and wildlife values, ODFW recommends this area be allocated to MA10e.

Cornpatch

This area contains two large meadow complexes (Big Bunchgrass and Cornpatch Prairie) along Big Bunchgrass Ridge which are used heavily by elk during the spring and summer. The northern portions along Black Creek include a large hardwood and cedar swamp used by wintering elk. ODFW recommends these two meadow areas and the Black Creek Swamp, along with wide no-cut forest buffers, be classified as special wildlife habitat areas (MA9b). ODFW recommends allocation of the Warner-McCready SOHA to MA10e, and the remaining area allocated to MA10d to meet the demand for SPNM hunting opportunities.

Hardesty Mountain

This area includes portions of two SOHA's (Lower and Upper Goodman). ODFW recommends allocation of the SOHA acres to MA10e, and the remaining areas to MA10d to meet demand for SPNM hunting opportunities.

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PROPOSED LAND AND RESOURCE MANAGEMENT PLAN

P.I-3 ODFW recommends the Forest establish a completion date for each of the implementation and action plans. To be meaningful for this planning period, the plans should be completed within the near future.

P.II-10 Information Needs

The Forest indicates there is need for information/research on spotted owls (9,10,11) and big game cover/forage (12). While ODFW supports continuing research, rigorous research on spotted owls has produced a voluminous database on habitat needs and agency management decisions have been made for now. The cover/forage requirements for big game result from ongoing investigations since initial research was conducted on the Millicoma Tree Farm in the early 70's. The Forest choose not to employ the cover:forage criteria that ODFW provided in its habitat protection criteria. Minimizing habitat constraints to the limits of species viability assures an uncertain future for the species.

FOREST MANAGEMENT DIRECTION (CHAPTER IV)

P.IV-2 The wildlife/fish section or the recreation section should have a specific goal to maintain or enhance fishing and hunting opportunities.

P.IV-3 Range/livestock grazing should mention compatibility with wildlife and riparian habitats.

P.IV-5 Paragraph 5

The Forest could mitigate some of the loss of dispersed recreation opportunities by road closures. ODFW recommends that these measures be explored and implemented when possible.

The projected shortages of thermal cover in the first decade is unacceptable to ODFW. To be meaningful for big game habitat, management cover/forage ratios need to be analyzed on an area basis (1000-6000 acres) for both summer and winter ranges. The proposed plan appears to provide adequate conditions on the winter range; but this would be to no avail if adequate conditions are not also provided on summer range. The shift of timber harvest to higher elevations due to the proposed plan could result in serious problems if cover/forage ratios are not followed. Since recent telemetry studies indicate a substantial summer movement of elk across the summit into Central Oregon, ODFW recommends cover/forage ratios be maintained to provide for this movement. Existing large blocks of summer thermal cover in wilderness areas should not be justification for overcutting the rest of the summer range. The Forest's projected downward trend over time for most wildlife species conflicts with ODFW's management goals.

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P.IV-6 The Forest's objectives for deer numbers are about the same as ODFW's. The elk objectives (projected outputs) are considerably less than ODFW desires in the fires decade. ODFW sees problems with projecting deer and elk numbers based on forage, especially for elk. Animals do not just appear where forage is created. If elk are to respond as projected there will need to be an aggressive trapping and transplanting program on the Forest to assure that animals are able to take advantage of forage provided. Adequate cover must also be provided where forage areas are created.

P.IV-9 The Forest's levels of primary cavity excavators on lands suitable for timber harvest appear to be overly optimistic. ODFW finds no current inventory of snags by size class. The standards and guidelines for protection of these species do not contain positive direction or measureable standards. If 20 percent of timber sale program quantity made up of cull/salvage/firewood, ODFW believes that a large part of primary cavity excavator habitat would be lost.

The Forest's increase in volume from both pre-commercial and commercial thinning will also severely reduce both quantity and quality of snag habitat in the future.

P.IV-10 Figure IV-D-1

In the DEIS Page IV-166, Figure IV-17-1 the miles of road construction is shown as being much higher. Which is correct?

P.IV-12 Figure IV-D-2

Over one-third of the watersheds indicate a potential risk of damage if disturbance occurs; therefore, special standards and guidelines must be developed to reduce potential impacts to fish and water quality.

P.IV-14 Paragraph 1

The Forest should use the term "legal-size wild trout," since ODFW defines "catchable trout" as hatchery yearlings stocked for the creel.

Paragraph 3

The 70 percent biological potential for primary cavity excavators cannot be maintained with 0.4 snags/acre (Brown, 1985).

P.IV-16 Figure IV-D-5

ODFW commends the Forest for the adequacy of special wildlife habitats and prescriptions. ODFW strongly supports the special wildlife habitats listed in Figure IV-D-5 and recommends MA 9e prescription be applied to the 17 streams listed in an ODFW letter to the Forest dated 14 July 1983. These streams possess large

populations of wild trout, high quality water, and high quality angling and recreational opportunities. ODFW recommends the following areas for inclusion as special wildlife habitats:

Lowell Ranger District

Sourgrass Meadow - Extensive high elevation meadows and tag alder openings are used heavily by deer and elk during spring, summer, and fall. Lowell Ranger District protects their portion and designates it as special wildlife habitat; however, Oakridge Ranger District does not. ODFW recommends the area be expanded to include those portions on the Oakridge Ranger District.

Rigdon Ranger District

Bristow Prairie - High elevation meadows and adjacent forest cover are used extensively by radio-collared elk from both the Willamette and Umpqua Forests. ODFW recommends protection of 405 acres as proposed in Alternative F.

Paddy's Valley - Extensive hardwoods and swamp are located along the Middle Fork. ODFW recommends protection of 470 acres as provided in Alternative D.

Groundhog Mountain - The area provides high elevation meadows and associated forest cover which are heavily used by elk and deer during spring, summer, and fall. ODFW recommends inclusion of the area into the Juniper Mountain/Joe's Prairie complex.

Oakridge Ranger District

Captain Prairie, Salt Rock Prairie, Long Prairie, and Etta Prairie - These are areas which have an extensive complex of meadows and adjacent cover, and are within the Waldo-Many Prairies Roadless area. They are important for big game during spring, summer, and fall. Recommend designation of these areas as special wildlife habitat areas.

Black Creek Swamp - The extensive swamp, hardwoods, and surrounding forest cover are used by wintering big game.

Heather Meadow - The area provides critical elk and deer winter range along Salt Creek and Highway 58. Past enhancement has included blasting potholes in the wet area to enhance waterfowl nesting.

Big Bunchgrass Meadow and Cornpatch Prairie - High elevation meadows and associated forest are used by elk and deer during spring, summer, and fall.

Horse Pasture Meadow - Alpine meadows and wet areas with associated forest cover are used extensively by radio-collared elk during spring and summer.

Grasshopper Mountain/Chucksney Mountain - The complex of meadows, wet areas, tag alder patches, and talus openings is heavily used by elk and deer during spring, summer, and fall.

Brock Meadow - This area provides critical winter range habitat for elk.

Major Prairie - This area, consisting of open meadows and shrubby hardwoods, provides critical winter range for elk.

Blue River Range District

Wolf Rock - ODFW recommends enlarging this area to approximately 600 acres (as proposed in Alternative D) to include the wet meadow, marsh, and adjacent forest cover.

McKenzie Ranger District

Horse Pasture Mountain/Taylor Castle Area - The mixed wet meadows, tag alder, talus slopes, and associated forest cover are important for deer and elk use.

Smith Ridge Lost Meadow Complex - The high elevation meadow with associated forest cover are important for deer and elk.

Sweet Home Ranger District

Daly-Parish Lake
Parks Creek
Lava Lake
Cone Peak
Browder Ridge
Two Girls Meadow

- Each of these areas are a focal point of elk and deer activity. Calving and fawning areas are found in all listed areas. All areas are important for forage production and are heavily grazed by deer and elk throughout the spring, summer, and fall. Lava Lake and Pigeon Prairie are used as resting areas for migrating Sand Hill Cranes each year.

Detroit Ranger District

Pigeon Prairie
Big Meadows
Bruno Meadows
Twin Meadows

P.IV-17 Threatened and Endangered Species

The Forest needs to include a category for sensitive species, listing the Oregon chub, bull trout and other species in this classification (see DEIS III-70, Figure III-J-1). State listed threatened and endangered species should also be mentioned.

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P.IV-20 ODFW supports the development and management concerns addressed for Oregon Cascades Recreation Area.

P.IV-21 Off-Road Vehicles

The Proposed Plan would open sixty-eight percent of the forest to ORV use. ODFW recommends regulated ORV use in big game winter range and other sensitive wildlife habitats.

P.IV-22 ODFW supports the Forest's wilderness management prescriptions. These are well done and show concern for maintaining high quality recreational experiences.

P.IV-24 The management prescriptions and descriptions given for old-growth groves are good. ODFW recommends a major portion of the Waldo-Moolack roadless area as an old-growth grove.

P.IV-25 The Forest needs to mentions management area prescriptions for H.J. Andrews and Research Natural areas. ODFW recommends that SOHA's within the H.J. Andrews be fully protected and maintained as higher priority than research goals of the H.J. Andrews.

P.IV-26 The Forest should mention compatibility with wildlife and specify which resource has priority in its range discussion.

P.IV-27 Figure IV-D-15

The figures for miles of road construction stated here differ from those stated in Figure IV-D-1. Which figure is correct?

Of new roads constructed 16.7 percent are constructed in roadless areas in decade one and 38.8 percent by decade five. Total new road construction in existing roadless area is 58.2 percent. ODFW recommends the Forest set a high priority on implementation of an aggressive travel management program to meet hunting demands and habitat effectiveness goals.

P.IV-32 Figure IV-D-18

ODFW supports the concept of maintaining forested lands to meet important habitat and wildlife objectives. ODFW strongly recommends withdrawing all of the riparian acres from scheduled timber harvest in order to meet objectives for soil protection, water quality, and fish and wildlife habitat. Such a withdrawal from timber management is critically needed in the 13 of 26 watersheds with "demonstrated channel instability or sediment related effects" and those watersheds that have a high "watershed sensitivity index."

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P.IV-34 The Forest estimates 20 percent of the total volume removed from the Forest is nonchargeable volume. ODFW believes this volume would have significant impacts on wildlife, particularly species dependent on snags and down woody habitats. Protection of these habitats at or above 60 percent of potential population levels is needed.

P.IV-36 Figure IV-D-22

The Forest's figure indicates that the first decade riparian area harvest of 312 MMBF is five percent of the proposed total decade one harvest. If five percent of the forest is in riparian acres (as the Forest has stated) it appears to ODFW that riparian areas will be managed on the same rotation and at the same intensity as the general forest. It also appears that if this level of harvest occurs on an areas that has 21.5 percent of the acres withdrawn and 39.5 percent of the miles already impacted, it will result in severe environmental degredation.

Using the Region 6 MMR distance guidelines for single pair SOHA's, ODFW concludes that at least 19 additional SOHA's are needed to fill gaps between SOHA's identified in Alternative J, particularly those providing connection to adjacent BLM lands and other national forests. These include both occupied and capable (future) spotted owl habitat areas (SOHA). Recommended additional SOHA's are listed below:

A. To Connect to BLM SOHA's

1. Elkhorn (AQ)
2. Moose Creek (EJ)
3. Moose Creek (EJ)
4. Cone Creek (MI)

B. To Connect With Adjacent Forest

1. Potato Hill (IA)
2. Paddy's Valley (3H)
3. Dome Rock (3E)

C. To Improve Distribution Within the Forest

1. Tidbuck Creek (MB)
2. Brush Creek (RB)
3. Cabin Creek (RF)
4. Cayuse Creek (ZE)
5. Warm Springs (ZD)
6. Cedar Creek (ZG)
7. Fuji-Marilyn (ZV)
8. Wolf-Hills (3R)

D. Capable SOHA's (approximate locations)

1. T11S, R6E, S.36
2. T13S, R4E, S.30
3. T15S, R4E, S.06
4. T15S, R7E, S.15
5. T23S, R4E, S.26

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As indicated under General Recommendations, ODFW recommends the Forest should emphasize the retention of existing large blocks of suitable habitat with multiple pairs of owls rather than small islands of habitat (single pairs).

Sustaining Habitat (SH): Based on research conducted on the Willamette and elsewhere ODFW recommends that at least 2,200 of old growth mature habitat be retained for each pair. Potential replacement habitat should be identified for each SOHA.

SOHA nesting, roosting, and feeding habitat areas should be consolidated into contiguous units over time. Management of fragmented habitat areas should be to incorporate young plantations into the SOHA overt time. Boundaries of SOHA's should be based on a known nesting core area and the best available habitat. Guidelines should be developed to address SOHA's lost to fire or wind. Salvage logging and road construction should be prohibited within SOHA boundaries.

Pileated Woodpecker

Based on recent work by Mellen (1987, M.S. Thesis, OSU) and Brown (1985), ODFW recommends the following changes to pileated standards and guidelines:

A. Nesting and roosting habitat areas should be increased to 495 acres of mature/old-growth forest. Home ranges of individual pileated averaged 1,100 acres and 500 acres represented the minimum amount of mature/old-growth found within the home range.

B. Potential nest trees should average 28 inch dbh (Mellen, 1987); roost tree averaged 47 inch dbh, thus old-growth is preferred.

C. Foraging habitat should be increased to 500 acres plus, with two snags/acre equal to or greater than 17 inches to meet needs of other primary cavity excavators.

D. Distribution of habitat areas are to be based on measurements from core center, according to regional MMR direction, not edge-to-edge as indicated in the DEIS. Additional SOHA's recommended by ODFW should provide for improved distribution without remapping pileated areas.

(Note the 500 acre nesting area is rounded off from 480 in Mellen (1987).

P.IV-47 Pine Marten

Pine marten areas should not become isolated islands of suitable habitat. Forested corridors and streamside buffers with high levels of downed logs should provide travelways for movement between areas and additional foraging habitat.

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It is unclear what is meant by "lower level habitat will reflect actual use in secondary habitat areas." How will the districts determine actual use and what is a secondary habitat area?

Bald Eagle

ODFW finds that except for a few isolated parcels, there is little suitable FS land near Green Peter Reservoir. One active nest is currently located on BLM lands. ODFW suggests this potential site be allocated to the Marion Lake area. ODFW also recommends that the habitat areas at Waldo Lake be moved to lower elevations because of the lake's high elevation and artificial food supply.

P.IV-48 Peregrine Falcon

The recovery plan does not provide specific guidelines for nest site management. Acceptable guidelines are not in place for active sites on the Umpqua NF and should be referred to.

Primary Cavity Excavators

The Forest is to be commended for their attempt to provide suitable habitat for population levels above 40 percent. However, ODFW recommends a target level of 60 percent (2 snags/acre, soft and hard, with replacement trees over the rotation) considering the uncertainty of managing for minimum level. (See Dead and Down Woody Habitats).

Although a 60 percent subpopulation level will probably be met during the life of the plan, our field observations indicate insufficient existing snags are surviving current logging operations to meet the 40 percent level now, let alone during an entire rotation. Small blocks of green timber and snags must be left in addition to scattered snags in order to improve the survival level of snags through logging and burning.

ODFW recommends that forest stands surrounding areas of past management activity with less than 60 percent potential population level be managed at the 100 percent level. Snag habitat must be distributed throughout commercial forest lanes to maintain the functional value of PCE.

P.IV-48 Roosevelt Elk/Black-tailed Deer

1.1. Change to read: 20 percent forage, 12 percent optimal thermal cover, at least 26 percent thermal cover, and the rest in hiding cover.

Add to 1.1.: "For each major drainage on the winter ranges, a 1/4 mile corridor will be established on each side of the stream to provide optimal thermal cover. Forage areas will be well distributed throughout the drainage."

The timber rotation needs to be programmed to meet the optimal thermal cover requirements. Optimal thermal and thermal cover need to be well distributed within RSA's.

2. Rewrite to read: "Provide effective hiding cover (conifers at least 10 feet tall)...adjacent to forage areas."

P.IV-49 2.3. On lines one and six of the standard, strike "when necessary" and "as necessary."

4. What is meant by "as expected?" The standard should meet ODFW benchmarks.

4.4. See Recommendations.

3. Oregon Chub

The Forest should add a provision to expand distribution of Oregon chub. Waters with Oregon chub should be allocated to Management Area 9b.

P.IV-50 Dead and Down Woody Material

The Willamette Wildlife Tree plan only briefly discusses logs and the proposed guidelines recommends leaving Class I and II logs only on selected forest lands (Page IV-32 of 1984 Snag Plan). Guides for general forest are not present. Forest plan guide recommends Class 3,4,5 logs as priority in conflict with the Snag Plan. Woody debris needs to be maintained on all treated acres. Eliminate "should" and insert will.

Guidelines should follow Brown (1985). Leave at least two Class I and 2 logs per acre, 12 to 17 inches at the large end and 20+ feet long. All Class 3, 4, and 5 logs with little commercial value should also be retained. See Recommendations.

Natural Opening, Cliffs, Caves, and Talus

Although natural openings, cliffs, caves, and talus may not be at risk due to management actions ODFW believes the Standards and Guidelines need to be stronger in order to protect these habitats.

P.IV-51 Range Management

Forest guidelines are needed for resolving conflict with wildlife use on range allotments.

P.IV-56 Timber Management

2. Harvest units need to be stocked before final overstory or seed tree removal.

3. Created openings should not exceed 40 acres in size.

4.b. The standard needs to be trees 10 feet tall, not 4-1/2 feet tall.

P.IV-58 Fuel Management

Standards and Guidelines for riparian and special habitat areas need to be strengthened with positive wording and expanded to protect wildlife trees, buffers on bogs, wetlands, meadows, cliffs, talus, or other special habitat areas, wherever they occur.

P.IV-60 Integrated Pest Management

ODFW recommends minimal vegetation control on winter range be restricted to non-chemical means.

Soil, Water, and Riparian Areas

Giving preferential consideration to dependent resources during conflicts is an excellent standard. The Forest mentions various required water quality standards, yet only water temperature is specified in the Plan. ODFW recommends items 9 and/or 10 include measurable criteria for turbidity or sedimentation. ODFW recommends standards such as those proposed by the Siskiyou and Umpqua Forest draft plans.

P.IV-61 4. Scheduling timber harvest to maintain hydrologic recovery is a valid method to help maintain fish habitat. ODFW recommends measurable threshold levels be established.

7. ODFW believes maintaining at least 90 percent of beneficial large woody debris may be adequate for undisturbed areas; however, 100 percent is needed for areas that have been degraded due to past management activities.

P.IV-62 9. The Forest needs to change "should" to "will not" cause temperature increases.

11. The Forest's operational consideration for fire protection is good.

11. and 13. The use of unmeasurable standards such as "maximum practical extent" is insufficient to address stream sediment concerns.

13.a(1) The Forest needs to add dry months construction to operational considerations.

14. and 15. The Forest's proposed standards for timber harvesting in riparian areas require a high level of professional input and sophistication. ODFW recommends placing all 46,842 riparian acres

in Management Area 9 - Special Habitat and under the several categories as appropriate. The importance of these areas for soil conservation, water quality, and fish and wildlife habitat deserve special recognition with a communsurate high level of protection.

14.b. ODFW believes that 80 percent shade should mean "stream surface shaded." This shade reference should also apply to both pre-activity and regenerated areas; as presently worded, such intent in unclear.

ODFW recommends that methods for, and recovery rates of, vegetative recovery should be specified, and be measurable.

14.c. The Forest's standard of seven percent harvest along Class III streams is 143 year rotation. ODFW does not believe this standard will provide an adequate size of material needed in the future for large woody debris component.

14.d. ODFW recommends an undisturbed area adjacent to all Class I and 2 streams be provided; only "probable cumulative effects" streams are afforded this protection as proposed.

Standards to determine minimum vegetative buffer widths applicable to each stream class should be included; ODFW previously recommended this be in the plan.

P.IV-63 15.a. ODFW recommends that unstable areas in riparian areas along all streams have restricted activity, nut just unstable Class 4 streams. Also, Class 4 streams should have specific protective provisions whether unstable or not.

MANAGEMENT AREA PRESCRIPTIONS

P.IV-69 MA9e is not utilized on any acres. ODFW previously suggested streams appropriate for this prescription and recommended their adoption. ODFW again makes this recognition.

P.IV-71 Wilderness

Under "Wildlife Management" for MA 1a, 1b, 1c, and 1d, the Forest states "Wildlife may be harvested under State regulation..." ODFW recommends the Forest change the title of this practice to "Habitat Management" and delete the reference to wildlife harvest.

P.IV-92 4. Motorized Use

ODFW recommends regulation of off-road vehicle use on the Indigo Lake trail to maintain popular semi-primitive angling, camping, and associated recreational uses of this lake.

P.IV-106 Recreation Management

1a. What is the time table for developing the old-growth grove plans?

Timber Management

2. Removal of salvage materials should not be permitted. Hazard trees should be felled and left on site.

P.IV-113 Wildlife Management

1. Planning

What is the timetable for plan preparation? Before monitoring can begin, the Forest must establish baseline data against which to monitor.

3. Habitat Protection

ODFW recommends snag habitat levels be maintained at 100 percent of potential in MA9a areas.

P.IV-115 Wildlife Management

Same comments as IV-113.

3. Enhancement

Forest enhancement projects must be prioritized and based on site specific needs.

4. Habitat Protection

ODFW recommends MA 9b designation for all big game winter ranges.

P.IV-118 Management Area 9c

ODFW concurs with the standards and guidelines for nonwilderness lakes.

Wildlife Management

Hazard trees may be cut but not removed from the site.

P.IV-122 Wildlife Management

Same comments as IV-118.

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P.IV-125 MA 10a through 10e

Under All Design and Implementation Practices it states; 1a. Soil, Water and Riparian, except 3b. In Section B Specific Standards there is no 3b.

P.IV-154 Developed Recreation

ODFW recommends development of meaningful and measurable standards and guidelines for riparian habitat for inclusion here. See Recommendations.

P.IV-163 Management Area 14 (General Forest)

ODFW cannot support the Standards and Guidelines for Management Area 14. The standards are inadequate for fish and wildlife management. Management activities for this allocation will effect fish and wildlife habitat diversity on nearly 700,000 acres. See Recommendations.

The Forest has proposed six timber management strategies, yet the acreage per strategy is not provided. Evaluation of the effect each of these strategies would have on other resources cannot be completed without knowing the acreage and location of each.

IMPLEMENTATION AND MONITORING (CHAPTER V)

P.V-1 What is the process for public review of the implementation monitoring documents?

P.V-6 Effectiveness Monitoring

The description, including Figure V-C-1, is too sketchy to provide firm direction. The Plan should address necessary written records, public involvement and review, and how to apply findings in order to avoid problems identified by the monitoring.

P.V-9 2. ODFW recommends annual water quality monitoring of selected Class I and II streams. The Forest needs to define the number and distribution of sites to be monitored. It would be beneficial if the Forest would promote a habitat deficiency inventory to document specific streams or areas that would benefit from enhancement projects.

A temperature monitoring program is needed for key drainages, such as the South Santiam River and Quartzville Creek, where cumulative effects of the watersheds are now borderline.

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P.V-10 3. "Sample by subdrainage" is not a method. ODFW recommends the Forest establish photo trend plots to monitor changes in diversity. The number and distribution of sites need defining.

4. ODFW recommends the Forest use LANDSAT to monitor old-growth standards.

P.V-12 ODFW recommends monitoring deer and elk range conditions using the Habitat Effectiveness Model developed by Wisdom et al. This monitoring should be combined with annual reporting and clearly display each factor in the HE model. Monitoring is needed to assure that Special Wildlife Habitats are managed to achieve protection goals.

The Forest needs to include monitoring of meadows, cliffs, and other special habitats.

ODFW recommends development of monitoring provisions for MIS resident trout. Monitoring fish populations before and after enhancement projects is needed to determine the effectiveness of those projects.

ODFW recommends annual monitoring of resident and anadromous fish spawning and smolt production indices in selected areas.

PROPOSED PLAN APPENDIX

D-15 Little Fall Creek fish ladder was completed by Weyerhaeuser Company in 1986 to benefit spring chinook not coho. Fall Creek/Winberry Creek steelhead hauling is done by the U.S. Army Corps of Engineers. McKenzie River hauling of spring chinook, not summer steelhead, is done by ODFW. No egg incubators for summer steelhead are permitted by ODFW in the Willamette Basin.

Figure D-6

ODFW recommends deleting this Figure because seven of the eleven projects do not depend on USFS, and of the remaining four, the USFS is not certain of its involvement.

D-19 Why does the schedule of snag creation for cavity excavators range from ten on Detroit to 75 at Lowell? What types of structures are proposed for bald eagles and peregrines?

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ODFW FISH AND WILDLIFE HABITAT PROTECTION CRITERIA FOR FORESTED LANDS, MARCH, 1985 (Revised September, 1986)

Old-Growth

1. The Forest meets standards.
2. Dedicated acres for spotted owl questionable.

   Dedicated acres for pileated questionable.

   Other species appear adequate - distribution of acres OK if increases made in SOHA's and pileated areas.
3. Acres of managed stands provided for.
4. Some areas have roads and woodcutting, or salvage may be permitted, does not meet criteria in managed old-growth areas.

Snags

1. No inventory is presented.
2. Criteria is met only in dedicated old-growth areas.

   Areas managed for primary cavity dwelling species do not meet criteria.
3. Forest does not meet criteria on areas programmed for harvest. Forty percent level proposed.
4. No methods discussed for protection of snags from fire or woodcutting.
5. Snag monitoring program is inadequate. Funding is questionable.

Dead and Down Woody Material

1. Habitat planned for ten to 100 percent level.
2. Protection strategies are not addressed.
3. Monitoring is not assured.

Hardwood and Minor Conifer Species

1. No information presented. Criteria not met.
2. Criteria not met.
3. N/A.

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Riparian

1. Acreage and condition are partially disclosed.
2. Evaluation parameters are not fully disclosed.
3. The preferred alternative does not appear to provide protection needed to meet water quality criteria other than temperature.

4 and 5. Restoration is discussed for degraded habitats. A majority of improvement and enhancement is dependent on actions of other agencies.

6. Habitat monitoring, as drafted, lacks specifics and is infrequent and dependent on questionable funding.

Meadow, Freshwater Wetlands, Natural Openings

1. Criteria are met through MA process where applied. Does not meet criteria on all meadows, freshwater wetlands, and natural openings.

2 and 3. Management strategies may not protect all listed habitats.

4. Permitted management activities meets criteria on designated areas only.
5. Current acreage is protected for wetlands only.

Cliffs, Rimrock, Caves, and Talus

1. Protection meets criteria.

Aquatic Habitats

1. Maintenance, enhancement, and restoration are described. ODFW criteria will probably not be met if water quality is degraded as appears probable under the preferred alternative.
2. Changes by decade are discussed, although measurable standards are lacking.
3. Baseline is current or natural condition.
4. Monitoring is planned but is subject to funding. Frequency and specific parameters are inadequate or undefined.

In-Stream Habitat

1. Criteria are not met in all alternatives.

   Preferred Alternative poses high degree of risk from actions on unstable areas.

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Water Quality

1. Desired temperature and turbidity criteria are not shown and may not be met.

2. Monitoring standards are inadequate.

Elk and Deer Habitat

1. N/A.

2. Described conditions meet criteria on described winter range. Conditions on MA 14 may not meet criteria.

3. Record keeping is by sub-basin.

4. Forage cover and scheduling are discussed.

   Road density and a habitat effectiveness model are not discussed.

5. a1. N/A.

   a2. Distribution not discussed.

   b1. N/A.

   b2. ODFW criteria generally met. Habitat effectiveness model not used.

6. Winter range is only special habitat identified and given adequate coverage. All others are inadequately described, evaluated, and protected.

7. Description of current condition winter range is discussed.

   Summer range condition is not discussed.

   Changes by alternative discussed for winter range only.

   Potential outputs are described.

8. Monitoring is planned for winter range.

   Frequency of observations and funding are questionable.

9. Habitat effectiveness models not used.

Species of Special Concern

Bald Eagle

1. and 2. Recovery plan to be followed.

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3. Monitoring planned subject to funding.

Peregrine Falcon

1. Habitat inventory discussed.

2. Potential sites protected.

3. Monitoring is planned.

Northern Spotted Owl

1. Defer to SEIS comments.

Western Snowy Plover

N/A

Western Spotted Frog

Not addressed.

Road Management

1. Plans included describing measures but are inadequate.

2. Impacts do not address HEI for elk or deer.

3. Criteria generally not met.

4. Not discussed.

Grazing

1. Grazing is discussed. Allotments are not described or illustrated on maps.

2. Forage allocations are not fully discussed. Resolution of conflicts not discussed.

Fish and Wildlife Habitat Protection Criteria for Forest Lands

March, 1985

Reformatted and Revised September 1986

Environmental Management Section
Oregon Department of Fish and Wildlife
506 S.W. Mill Street, P.O. Box 3503, Portland, Oregon 97208

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Special Wildlife Habitats and Habitat Features

The Department's habitat diversity objective on managed forest lands throughout the state is to encourage perpetuation of the naturally occurring mix of habitat types, and plant communities in sufficient amounts adequately distributed to maintain wildlife species in compliance with Oregon's Nongame Wildlife Plan ORS 635-100-001 through 635-100-030.

Old growth	1. A minimum of 5% to 15% of each major plant community in the forest is dedicated old growth stands, well distributed by slope, aspect, and elevation throughout the forest. 2. Dedicated old growth[1] stands must include a sufficient amount and distribution of existing stands to maintain the existing populations of old growth dependent species. 3. Managed old growth stands will be in addition to, and not in lieu of, dedicated old growth stands. 4. Criteria will not be met in old growth areas where fuel wood cutting and open roads are permitted.
Snags	1. An inventory of existing snags and potential snag habitat is included. 2. A sufficient amount of habitat is provided to maintain cavity dwelling species at 100% of the population potential in areas managed especially for old growth, old growth species, and cavity dwelling species. 3. On the remainder of the forest, habitat is provided to maintain cavity dwelling species at or above 60% of the population potential. 4. Methods to protect snags and leave trees from slash burning and fuel wood cutting are assured. 5. A snag habitat monitoring program is assured.
Dead and down woody material	1. Dead and down woody material is planned for and provided, based on published guidelines, to maintain dependent wildlife species in the planning area. 2. Strategies are included to protect the habitat components from fuels management, slash disposal, fuel wood cutting, and yarding activities. 3. A habitat monitoring program is assured. (Brown 1985 and Thomas 1979).
Hardwoods and "minor" Conifer Species	1. At least 10 percent stocking of naturally occurring hardwood species and at least 10 percent stocking of "minor" conifer species should be retained. 2. In contiguous hard-wood stands (i.e., alder, oak, tan oak) at least 25 percent of the stand should be retained through the natural succession, except for migratory deer winter ranges in southern Oregon. 3. Migratory winter ranges are generally composed of oak-grassland habitat interspersed with scattered conifer groves (generally 5 to 40 acres in size). All existing acreage of this habitat type should be retained (including the conifer groves) with management activities limited to those which will ennance winter range values.[1]
Riparian	1. Total riparian acreage and existing conditions are shown. 2. Evaluation parameters for management of riparian habitat are: (a) stream surface shaded (b) streambank stability (c) streambed sedimentation (d) Grass-forb cover (e) shrub cover (f) tree cover.

[1] See glossary for "old growth".

[1] These criteria are not intended to conflict with special management prescriptions for riparian zones or stream buffers which may include more restrictive retention standards.

	3. Riparian habitats are managed to maintain or improve water quality and fish and wild life habitat values.
	4. Restoration of degraded riparian habitat to at least 80 percent of potential is planned.
	5. The habitat restoration target to be achieved within the life of the plan (10 years) is included. (8).
	6. Habitat monitoring system is assured.
Meadows, Freshwater Wetlands, Natural Openings	1. Integrity and effectiveness of the habitat for wildlife use is maintained.
	2. Ninety percent of the peripheral vegetation is maintained one sight distance wide.
	3. Two-thirds of the cover outside the periphery must remain at all times in natural condition.
	4. Livestock grazing, logging practices, recreational use (horses, ORV's, etc.) and other activities are managed to protect the natural conditions of these habitats.
	5. The current acreage in each of these habitat types is preserved. Protective measures will be based on published guidelines and considerations. (Brown 1985; Thomas 1979; (5), (a), (b), (c); (8)).
Cliffs, Rimrock, Caves, and Talus	1. Management considerations in published guidelines are used to achieve maximum protection of these habitats. Conflicting uses and activities include: (a) physical alteration (b) road construction and location (c) quarries (d) clearing of adjacent cover (e) recreational activities and other human disturbances. (Brown 1985; Thomas 1979).
Aquatic Habitats	1. Maintenance, enhancement, and restoration of aquatic ecosystems to meet Oregon Department of Fish and Wildlife objectives is described.
	2. Changes expected by decade using FHI (Fish Habitat Index) or other accepted models are displayed.
	3. The baseline for changes should be the current management level or condition.
	4. A monitoring plan is assured.
In-stream Habitat	1. In-stream integrity is maintained, enhanced or restored to acceptable levels, including flow, channel stability, cover, substrate quality and fish passage opportunity.
Water Quality	1. Water quality parameters (especially temperature and suspended sediments) are maintained or restored to acceptable levels.
	2. Monitoring procedures are assured.
Water Quantity	1. No less than the minimum existing stream-flows[1] and seasonal patterns are maintained.
	2. Monitoring is assured.

Elk and Deer Habitat

1. Eastern Oregon

Habitat conditions for Rocky Mountain elk and mule deer (includes white-tailed deer) based on published guidelines are provided which will sustain no less than ODFW management objectives (based on conditions in 1977-1980). The objectives identify, by wildlife unit, the size of the overwinter population and the ratio of males per 100 females. An optimum habitat condition is required to meet the recruitment goals based on reproductive performance up to 1980.

2. Western Oregon

Optimum habitat conditions based on published guidelines are provided which will allow for an increase in elk and deer populations and will meet recruitment goals based on herd performance up to 1980.

3. Permanent habitat planning and record-keeping areas will be of the following sizes:

   a. Eastern Oregon - approximately 10,000 acres.
   b. Western Oregon - 1,000 to 6,000 acres.

[1] State Water Resources Board, Salem.

4. Habitat conditions in the permanent planning area are described using size and spacing and road density. In western Oregon forage quality and cover quality must be included.

5. Elk and deer cover and forage requirements by geographic area are included using the following descriptions:

   a. Summer Range

      (1) Eastern Oregon - a total of 40% cover well distributed over the summer range comprised of the following components: 10% thermal cover[1], 20% hiding cover[2]; and 10% of either hiding or thermal cover (thermal, preferably). Thomas 1979. (p. 121, fig. 72.

      (2) Western Oregon - a total of 50% in well distributed thermal cover stands (of which at least 25 percent is optimal thermal cover)[3], and about 20% in forage areas.

   b. Winter Range

      (1) Eastern Oregon - 50% of the area in well distributed thermal cover stands.

      (2) Western Oregon - a total of 50% in well distributed thermal cover stands (of which at least 25 percent is optimal thermal cover), and about 20% in forage areas.

      West Slope Cascades - In addition to the above, on each major drainage corridor in winter range a belt 1/4 mile wide on each side of the stream will be in optimal thermal cover (21" d.b.h. and greater on approximately a 200 year rotation). Forage areas (clearcuts 0" to 5" d.b.h.) will not exceed 10 acres in size and will be well distributed throughout the drainage. The rotation produces a sustainable ratio of 50% optimal thermal cover, 25% thermal cover, 15% thermal shade (hiding cover) and 10% forage.

6. The following special elk habitats are identified in the permanent planning area for special management or protection: (1) calving and fawning areas; (2) calf rearing and fawn rearing areas; (3) travelways; (4) known breeding areas; (5) winter range; (6) high use areas such as riverine habitat, basins, meadows, grass/timber mosaics, benches, and mineral licks.

7. The plan describes the following:

   a. Current situation.
   b. Changes by alternative.
   c. Maximized deer and elk output or potential outputs.

---

1 See glossary for definition of thermal cover.
2 See glossary for definition of hiding cover.
3 See glossary for definition of optimal thermal cover.

8. The plan assures monitoring of the cumulative affects of habitat conditions in the permanent planning areas through time.

9. The plan predicts changes in habitat using habitat effectiveness procedures. (11), (14).

Species of Special Concern - Federal and State Threatened and Endangered Species

Federally threatened and endangered species are provided for as required by the Endangered Species Act of 1973.

Bald eagle	1. Protective measures for existing nests, roosting, feeding and wintering areas meet the requirements of the Bald Eagle Management Guidelines, Oregon-Washington, USDI Fish and Wildlife Service.
	2. Potential habitat is protected as set forth in the Bald Eagle Recovery Plan.
	3. Adequate habitat monitoring is assured to determine the effectiveness of planned action and recovery efforts.
Peregrine falcon	1. Habitat inventory is displayed.
	2. Existing and potential nesting and feeding habitat is protected in a sufficient amount to meet the objectives in the Pacific Coast Recovery Plan for the American Peregrine Falcon, August 1982. Objectives will be revised as necessary to reflect the most current scientific information.
	3. Adequate habitat monitoring is assured to determine the effectiveness of planned action and recovery efforts.
Northern spotted owl	1. Habitat areas of proper size, distribution and spacing to maintain the species in perpetuity are provided and protected that meet or exceed standards contained in the Oregon Interagency Spotted Owl Management Plan. The standards will be revised to meet the most current scientific information.
	2. Adequate habitat monitoring is assured to determine the effectiveness of planned action.

Western snowy plover Western spotted frog (W. Ore.)	1. Existing habitat is maintained. 2. Degraded habitat is restored with the objective of building populations of appropriate species sufficient to cause delisting. 3. Habitat is provided for snowy plover in accordance with the Draft Western Snowy Plover Plan for Oregon. 4. Adequate habitat monitoring is assured to determine the effectiveness of planned action.
Road Management	1. Road management plans are included which describe measures to: (a) protect fish and wildlife habitat values (b) minimize disturbance of fish and wildlife (c) promote increased quality of recreational experiences 2. Impacts of roading must be addressed in overall habitat effectiveness evaluations for deer and elk using appropriate guidelines. (Brown 1985; Thomas 1979; (1); (6); (12)). 3. Criteria will generally not be met if new road systems are not designed to avoid important wildlife habitat areas such as winter ranges, thermal cover areas, known elk breeding areas, travelways, riparian areas except at crossings, and dedicated old growth stands. 4. Existing roads are managed to minimize conflicts in these areas. For the purpose of road management and closures to motor vehicles, motor vehicles will include any motor propelled vehicles, regardless of width.
Grazing	1. Existing and proposed livestock grazing systems are described by allotment. Descriptions of allotments will include: (a) a map showing allotments (b) range condition and trend data (c) proposed range improvements (d) a monitoringprocedure (e) a management adjustment procedure

2. If forage is allocated for big game, allocations are based on realistic evaluations of livestock and big game competition as described in reference (10), Chapter 10, page 415. Evaluations must be based on:

(a) animal distribution
(b) timing of grazing
(c) forage availability
(d) height of reach
(e) diet similarity

GLOSSARY

CROWN CLOSURE	The percent of ground area covered by the tree and shrub canopy when viewed from overhead.
HABITAT DIVERSITY	The relative degree of abundance of various habitat types, plant species or plant communities on a given area.
HIDING COVER, ELK/DEER	A vegetation stand at least 600 feet wide which is capable of hiding from human view 90 percent of a standing adult animal at 200 feet or less, generally meaning any vegetation used by deer or elk for security or escape purposes.
OLD GROWTH	Generally a forest stand several hundred years old, characterized by a mixture of large, old seral-dominant trees and a subcanopy of shade-tolerant trees, some showing decadence, and an understory of shade-tolerant herbs and shrubs. Key elements of old growth forests are: (a) large live trees; (b) large snags; and (c) large down logs, both in stream and on land. Snags and down logs are in various stages of decomposition. Other common features are dense, deep, multi-layered canopies and a range of tree sizes and ages. Exact composition, structure, and age vary regionally (e.g. sitka spruce in coastal forests, noble fir in subalpine forests, and white fir in the Blue Mountains) and locally depending on moisture and temperature regimes. Mixtures of several tree species are common (Brown 1985; Thomas 1979; (2), (9)).
THERMAL COVER, OPTIMAL THERMAL COVER	A multi-layered forest stand 40 feet or more in height, with 70% or greater average crown closure 30 to 60 acres in size and from 400 to 1,200 feet wide. In addition Optimal Thermal Cover, as used in western Oregon, is a stand of trees with 21 inches d.b.h. or greater for maximum snow intercept capability. Where mule deer are the primary species, thermal cover is a stand of saplings or shrubs, evergreen or deciduous, at least 5 feet tall, with 70% or more crown closure; or a forest stand of at least pole size or larger with a crown closure of 70% or more. Optimum sized areas from 2 to 5 acres. On winter range all thermal cover must be evergreen and may include any of the following: (a) a forest stand of at least pole-sapling stage; (b) tree and shrub combinations such as juniper/big sagebrush; (c) juniper; and (d) shrub stands such as Mountain big sagebrush, Mountain mahogony, or Bitterbrush (16); Thomas 1979; (5)(a).

TRAVELWAYS	All routes used by animals to move from one area to another. Includes terms: travel route, travel corridor, migration route, and migration corridor. It is generally the most suitable route in that it has the easiest access (i.e., on ridgetops or floodplains), and cover to meet climatic needs.

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(15) USDA Forest Service Letter 2610, Cooperative Relations, Pacific Northwest Region. 1979.

(16) USDA Forest Service. Wildlife Habitat Relationships of South Central Oregon by Area 4 National Forests. 230 pp. 1976.

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D4-8

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE
910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (

January 25, 1988

Bob Brown, Director
Oregon Department of Forestry
2600 State Street
Salem, Oregon 97310

Dear Mr. Brown:

The Oregon Department of Geology and Mineral Industries has reviewed the Draft Environmental Impact Statement for the Willamette National Forest. From our minerals perspective some very fundamental issues are either not addressed or are insufficiently covered in the impact statement. This letter briefly summarizes the issues in hopes of enabling the Forest Service to better address the minerals problem.

A major concern is the need to approach minerals from the perspective of national mineral policy and economic potential. There is a need to better quantify the value of the resource and to factor the resource value into the various alternatives for land use. In terms of quantification, we find that numerical dollar values for the mining resource are not provided. From an economic standpoint, this is particularly troublesome because the per-acre value of mining land greatly exceeds any other per-acre value for other uses. In terms of alternative land uses, we find very little discussion of minerals access or mineral policy direction in the alternatives.

Inadequate quantification of the value of energy and mineral resources in the forest is a problem in the following parts of the forest plan and EIS: (1) (ref. p. B-9) large-scale maps were used to show wildlife habitats but a 1:500,000-scale map was used for minerals; (2) (ref. p. B-88) no value was listed for minerals; (3) (ref. p. III-5-6) the word "minor" was used to describe historic gold and silver production from the forest's mining districts which, is presumably based on Figure III-X-1 (p. III-198), a table

listing mineral production in 1890-1940 dollar values. These minerals at today's prices would be worth approximately $4-5,000,000 -- not a "minor" amount; and (4) (ref. p. B-92, C-8-13, C-18-21, C-24-29, C-34, C-42-43, D-9, II-124, II-133, III-5) mineral and geothermal resources are affected by the management options listed on these pages and other parts of the EIS, but no estimates of potential value lost or retained are given, although statements like "low value" or "small, isolated pockets with questionable potential" (e.g. p. III-197-202) are used to characterize mineral and geothermal resource areas, even areas with extensive active lease positions.

The department recommends quantitative estimates rather than the above vague, qualitative estimates of mineral and energy resource potential. On pages II-133-134 of the EIS, lack of quantitative estimates of future mineral and energy production is defended because these estimates are "highly speculative." Whereas these estimates are by their very nature speculative, they are scientifically defensible, unlike the qualitative statements utilized in the EIS as written. Estimates of geothermal potential are given in the four-state geothermal assessment sponsored by BPA (Bloomquist and others, 1985, WAOENG-85-92a DOE/BP-13609-1, WAOENG-85-92b DOE/BP-13609-2, available from the Washington State Energy Office or BPA). Competent geologists could be assigned the task of doing preliminary estimates of the value of the metallic resources in the mining districts based on published data from, for example, OSU and PSU geology masters theses which cover virtually all of the districts.

A number of the management areas have a negative impact on mineral resource development. This negative impact is partly explicit (i.e. the EIS states that lands are withdrawn from mineral extraction), or it is implicit, owing to competition from vaguely defined visual or recreational resources. The latter issue is much more serious than the former in terms of the amount of area affected. For example, much of the Santiam Pass area, where active volcanism and extensive geothermal leases indicate high geothermal potential, is classified "Partial Retention" for visual quality objectives illustrated on Figures III-N-2 and III-N-3, p. III-111-112. The definition of this category does not explicitly state the effect on geothermal power plants or production wells. Geologists in industry have found that the effect is to zone the area "no surface occupancy" for geothermal power plants. If this is the case, it should be explicitly stated, and the reasoning

behind the zoning should be defended by quantitative studies of the actual effect of facilities which might reasonably be expected to be sited (e.g. in the case of a geothermal plant, small modular units). The department recommends that these studies be accomplished by experts who are experienced with the design and siting characteristics of geothermal or mineral resource extraction facilities.

In the case of geothermal energy, the resource extraction facility can be either (1) direct use of the fluid for heating or (2) conversion of the fluid to electrical energy in a geothermal power plant. The environmental impact of these two uses is very different, but this is not discussed anywhere in the EIS. The issue is directly relevant to zoning along the McKenzie River, where a 1-mile-wide corridor is exempted from geothermal development (ref. p. E-9-11). This area has a number of active hot springs and almost certainly has a shallow geothermal resource between the hot springs (e.g. see Geothermal Resources Map of Oregon, 1982, available from DOGAMI) which could be used for direct heating of small cabins and other modest facilities (see the above-cited BPA report for estimate of resource size and value). This use is presently occurring in the corridor at Belknap Hot Springs. It is unclear from the EIS that direct use has been distinguished from potentially more intrusive uses such as large-scale geothermal power plant construction.

A related issue is the possibility of extraction of geothermal resources by directional drilling from areas where geothermal leasing is allowed to areas where leasing is at present not allowed. Extraction of geothermal resources by directional drilling under an environmentally sensitive area is unlikely to affect the surface at all. Therefore geothermal leasing could be allowed in all forest lands with the stipulation of no surface occupancy, where appropriate. This would circumvent the need for the USFS to prejudge industry's ability to reach resources by directional drilling. The marketplace would make this judgment.

There are some specific problems with land use restrictions on active or patented mining claims. It is not clear that the USFS can restrict access or activities in these kinds of areas. Examples are (1) proposed closing of the McQuade Creek road which has active mining claims (p. C-50); (2) statements to the effect that locatable mineral development can be stopped in roadless areas (p. III-145; and see where this is contradicted by a statement on p. IV-

194); (3) land including patented claims in the Blue River-Calapooia River mining district is set aside for arrowhead collecting (p. IV-101). Access to mines and lands of demonstrated mineral potential should be an exclusion from the road closures which affect the above areas. Active mining should be allowed provided a suitable reclamation plan is developed.

A major goal of the Department is to maintain a strong well-planned mineral resource base for the State of Oregon and to see that mined lands are reclaimed. This Forest plan makes the attempt to recognize that there are minerals and mining, but does not adequately consider minerals in designing alternatives or recommendations for land classification. The data that are provided are not utilized in a meaningful way and do not display the impact of the various alternatives on mineral production.

For Oregonians, the economic productivity of National Forests in Oregon needs to be evaluated in terms of all potential revenue sources, not just timber and recreation. Our declining economic yield from forest lands in terms of employment, tax base and federal revenues is due in part to historical over-dependence on timber and recreation values. Mineral resource values should be vigorously evaluated in the current U.S. Forest Service planning process.

Sincerely

George R. Priest

George R. Priest
Regional Geologist

CC: Norm Johnson, Executive Department
Don Hull
John Beaulieu
Jerry Gray

Department of Human Resources

EMPLOYMENT DIVISION

875 UNION STREET N.E., SALEM, OREGON 97311

March 15, 1988

IN REPLY REFER TO
RES:JRI
R&S 2

TO: Ann Hanus, State Economist
Executive Department

FROM: D.R. Steward, Ass't Administrator
for Research & Statistics

SUBJECT: Willamette National Forest Plan

The attached comments from Earl Fairbanks, Regional Economist for the Mid-Willamette Valley, and Ken Rocco, Regional Economist for the Eugene-Springfield MSA, address the issues you identified earlier regarding the Willamette National Forest Draft Plan. Please let me know if any revisions are necessary.

Attachments

DRS:krg

cc: Fairbanks
Rocco
Staten

0099A/58

REVIEW OF WILLAMETTE FOREST PLAN
Earl Fairbanks
Regional Economist

On the whole I agree with the concepts of plan J, the preferred plan. It is important to the continued livability of the Willamette Valley to guard the quality of our water supply, to provide adequate areas for recreation for our growing population, and to provide enough raw material (trees) to the area's established lumber producers. The valley's high livability quotient is, and will continue to be, one of Oregon's strengths in its economic developement efforts.

However, the plan J seems to not provide the level of available timber for local mills to maintain established levels of product output. If the means to support current production levels are not provided, serious displacement in the local industry may well occur. Some of the problems that would come as a result of restricted raw materials supply may include high bid prices for available timber and lower than optimal productivity from existing facilities which would lead to a weakened competitive position and to a loss of jobs and income into local communities.

Although it is difficult to find straight-forward comparative data in the plan, it appears that the available timber supply will shrink considerably with plan J. The plan talks about "volume of standing trees on land allocated to timber management will be less...". This statement may sound like the forest will slowly be depleted of trees even under plan J. Unless you read elsewhere you may not know that the land allocated for harvest is to decrease from 64% of the total forest to 51% and that over a third of the 51% was to be under a restricted allocation.

Will there be a restriction in the supply of timber? Figure E-W-1, a comparison of the alternative plans says the timber supply will be reduced to 89% of the current plan. Figure IV-1é-6 shows numbers indicating that plan J would allow 86-87 percent of the more current harvest levels.

This percentage, in the high eighties, is very close to the percentage the new plan's allowable sale will be of the 1985/86 average cut. Figure III-W-2 shows the 1985/86 average cut at 766.9 MMBF while the Figure E-F-12 shows the new allowable sale quantity to be 663 MMBF. In actual practice, the volume sold has always been greater than the actual cut. Figure III-W-2 shows that between 1977 and 1986 the percent of sold that was cut averaged 77% with a high of 98% in 1985 to a low of 51% in 1982. Although the Forest Service has said that timber uncut will be put back into the market, the net effect of the restricted timber supply will be high prices to the local wood products producer with a scenario of high demand and low supply especially in years such as in the past several years when the lumber industry sold nearly all it could produce.

Of prime importance to our mid-valley economies is that the local lumber producers need to remain competative in the face of increasing foreign and domestic competition. The tighter the financial squeeze on these employers, the more likely some will cease operation or

look harder at reducing costs, including cutting labor costs by using fewer workers.

A reduction in the allowable cut to 86 percent of the 1985/86 average will translate into a loss of jobs even though Figure E-E-3 says plan J will increase the number of jobs by 1,237. The increase of 1,237 is because the base period of 1977-1985 is used which includes the recession of the early 1980s which devastated the lumber products industry in the state. About the only way this 86% cutback would not contribute to a loss of jobs would be if we entered another hard recession and the market for lumber products fell way off again.

Any loss of jobs will be especially felt in the small towns and communities of western Marion and Linn counties. Even in Marion County, payrolls generated by the lumber industry accounts for every one out of twenty dollars in payrolls and in Linn County, one in five.

The percent of families with income below povery level in 1979 tends to be above the state average of 7.7%: Lebanon, 11.6%; Mt. Angel, 9.9%; and Sweet Home, 17.4%. Since this data was collected for 1979, current figures would exceed these since many jobs lost during the recession have not returned. Also many jobs in the industry are now paying lower wages than before which means fewer dollars flowing into the communities.

March 10, 1988

TO: Michael D. Staten, LMI Programs Unit Manager
Research & Statistics

FROM: Kenneth G. Rocco, Regional Economist
Research & Statistics, Eugene

SUBJECT: Comments on the Willamette National Forest Plan

The Willamette National Forest is a resource vital to the long-term social and economic conditions of Western Oregon, especially for communities and counties in the Mid-Willamette Valley. Employment opportunities, county revenues, and recreational experiences are all impacted by the manner in which the WNF is managed. For the counties of Lane, Linn, and Marion, the Forest provided 42% of the timber harvested between 1976 and 1985, most of which was processed in the local area. The Forest returned nearly $22 million in revenue from the 25% of receipts formula towards local government operating expenses. The Forest regularly records roughly 3 million recreation visitor days worth of activity, mainly from area residents using the Forest for camping, hiking, skiing, fishing, and other outdoor activities.

Due to the variety of functions of the Forest and to legislation mandating multiple use of its resources, the Proposed Land and Resource Management Plan for the Willamette National Forest offers a set of alternative plans aimed at maximizing the forest outputs. Since the Forest has a finite number of outputs to give, not all interest groups will be able to achieve maximum goals from the Forest resources.

Economic conditions in the Primary Zone of influence of the WNF (Lane, Linn, and Marion Counties) have trended positively for nearly four years. Annual average unemployment rates during 1987 fell to their lowest levels for at least the past decade (5.7% in Lane, for example, the lowest annual average since 1969). Wage and salary employment rose to near record highs in Lane County at 104,300, nearly 99% of the peak annual average of 1979. The Primary Zone continues to be more reliant on the lumber and wood products industry than the state as a whole, 8.4% of total nonag employment in the Primary Zone versus 6.2% statewide. Lane and Linn show even more dependency on lumber employment with the industry comprising 10.5% and 16.0% of total nonagricultural wage and salary employment in 1987, respectively.

COMPARATIVE ECONOMIC DATA

INDICATOR	LANE	LINN	MARION*	PRIMARY ZONE**	OREGON
1987 EMPLOYMENT:					
Total Wage & Salary	104,300	29,290	96,000	229,590	1,094,000
Manufacturing	19,600	10,000	14,500	44,100	204,900
Lumber	11,000	4,690	3,600	19,290	67,400
Nonmanufacturing	84,800	19,290	81,500	185,590	889,100
1987 % OF TOTAL:					
Total Wage & Salary	100.0	100.0	100.0	100.0	100.0
Manufacturing	18.8	34.1	15.1	19.2	18.7
Lumber	10.5	16.0	3.8	8.4	6.2
Nonmanufacturing	81.3	65.9	84.9	80.8	81.3
1987 AS % OF 1979:					
Total Wage & Salary	98.8	94.4	106.8	101.4	103.6
Manufacturing	92.0	87.4	94.2	91.6	89.7
Lumber	76.9	83.9	85.7	80.1	83.0
Nonmanufacturing	100.6	98.5	109.4	104.0	107.4
POPULATION:					
1980 Census	275,226	89,495	204,692	569,413	2,633,156
1987 PSU	267,700	87,000	214,500	569,200	2,690,000
% Change	-2.7	-2.8	4.8	0.0	2.2
PERSONAL INCOME (000s):					
1979 Total	$2,164,905	$671,896	$1,608,104	$4,444,905	$22,383,636
1984 Total	$2,814,521	$902,571	$2,314,816	$6,031,908	$31,055,924
% Change	30.0	34.3	43.9	35.7	38.7
1979 Per Capita	$8,083	$7,549	$8,097	$8,003	$9,134
1984 Per Capita	$10,565	$10,032	$11,029	$10,651	$12,011
% Change	30.7	32.9	36.2	33.1	31.5

* EMPLOYMENT DATA FOR SALEM MSA (MARION AND POLK COUNTIES)
** EMPLOYMENT DATA INCLUDES POLK COUNTY

Although lumber and wood products continues to be the major base industry in the Primary Zone, lumber's relative position has been under increasing pressure from growth in other sectors and from general market conditions impacting the lumber industry. In each of the three counties in the Primary Zone, lumber and wood comprised a lower percentage of total nonag employment and total covered payroll in 1986 than it did during the late 1970s. Lane County's lumber industry fell from employment levels in excess of 14,000 in the late 1970s to just above 10,000 in 1986; employment did rise to 11,000 during 1987, based on preliminary data. Payroll in Lane's lumber industry fell from a 22.5% share of total covered payroll in 1977 to only 15.0% in 1986.

For the entire Primary Zone, lumber employment fell from a peak of 22,465 in 1979 to 16,728 in 1986 with an accompanying decline from 552 to 506 reporting units. Lumber payroll as a percent of total payroll steadily declined from 16.3% in 1977 to 11.0% in 1986. Average pay per lumber worker tended to rise over the time period, but well below increases in the consumer price index. The average pay rose by 51% between 1977 and 1986 compared to an 81% increase in the national CPI over the same period.

COVERED PAYROLL AND EMPLOYMENT

LANE COUNTY

YEAR	UNITS	AVERAGE EMPLOYMENT	TOTAL PAYROLL	AVERAGE PAY PER EMPLOYEE	LUMBER PAY AS % OF TOTAL PAY
1986	300	10,080	$241,927,492	$24,001	15.0
1985	300	10,723	255,138,710	23,794	16.4
1984	305	11,805	268,705,226	22,762	18.0
1983	291	10,750	245,770,666	22,862	17.8
1982	281	10,502	225,868,313	21,507	17.3
1981	305	11,948	247,220,724	20,691	18.0
1980	311	12,776	254,810,916	19,944	19.1
1979	322	14,292	266,456,713	18,644	20.7
1978	321	14,276	246,846,768	17,291	21.3
1977	310	14,131	223,268,166	15,800	22.5

COVERED PAYROLL AND EMPLOYMENT

LINN COUNTY

YEAR	UNITS	AVERAGE EMPLOYMENT	TOTAL PAYROLL	AVERAGE PAY PER EMPLOYEE	LUMBER PAY AS % OF TOTAL PAY
1986	121	4,341	$99,359,513	$22,889	19.0
1985	122	4,499	108,778,840	24,178	21.1
1984	124	4,950	115,459,002	23,325	22.9
1983	118	4,955	110,764,689	22,354	23.4
1982	119	4,652	94,273,002	20,265	20.9
1981	126	5,018	101,933,441	20,314	21.8
1980	125	5,216	99,883,974	19,150	22.1
1979	130	5,589	100,566,872	17,994	23.9
1978	122	5,549	92,879,997	16,738	24.0
1977	123	5,615	84,942,595	15,128	25.2

COVERED PAYROLL AND EMPLOYMENT

MARION COUNTY

YEAR	UNITS	AVERAGE EMPLOYMENT	TOTAL PAYROLL	AVERAGE PAY PER EMPLOYEE	LUMBER PAY AS % OF TOTAL PAY
1986	85	2,307	$44,269,603	$19,189	3.3
1985	85	2,158	43,904,259	20,345	3.4
1984	90	2,026	40,140,352	19,813	3.4
1983	86	1,782	35,219,746	19,764	3.2
1982	95	1,561	26,359,523	16,886	2.5
1981	99	2,056	35,319,948	17,179	3.3
1980	101	2,111	34,911,900	16,538	3.4
1979	100	2,584	39,421,231	15,256	4.1
1978	93	2,441	33,374,605	13,673	3.9
1977	87	2,178	27,297,477	12,533	3.7

COVERED PAYROLL AND EMPLOYMENT

PRIMARY ZONE COUNTIES

YEAR	UNITS	AVERAGE EMPLOYMENT	TOTAL PAYROLL	AVERAGE PAY PER EMPLOYEE	LUMBER PAY AS % OF TOTAL PAY
1986	506	16,728	385,556,608	$23,049	11.0
1985	507	17,380	407,821,809	23,465	12.2
1984	519	18,781	424,304,580	22,592	13.3
1983	495	17,487	391,755,101	22,403	13.2
1982	495	16,715	346,500,838	20,730	12.3
1981	530	19,022	384,474,113	20,212	13.2
1980	537	20,103	389,606,790	19,381	13.9
1979	552	22,465	406,444,816	18,092	15.2
1978	536	22,266	373,101,370	16,757	15.5
1977	520	21,924	335,508,238	15,303	16.3

Much of the public debate on the Proposed Land and Resource Management Plan for the WNF centers on the Preferred Alternative's Allowable Sale Quantity target and its relationship to employment levels. Those interested in maximizing the timber resource of the WNF contend that low ASQs mean low employment and community instability. The Plan's use of a 10-year average of sales and harvests from the 1977-1986 period is questioned due to the inclusion of exceptionally low years of demand and production in the early 1980s due to recession.

Actual sales in the period averaged 627 MMBF per year while the actual harvest averages out to only 486 MMBF per year. The allowable cut under the current plan stands at 641 MMBF. The Preferred Alternative J would provide an ASQ of 568 MMBF, more than what was harvested on average during the past decade, but less than the average sale amount. Last year's harvest of 718 MMBF is pointed out as a more normal picture of future demand levels. Concern is also centered on the reduction of full-yield lands from 55% of all land under the current plan to only 32% in the Preferred Alternative with limited yield lands rising from 9% to 19%.

In opposition to these arguments are the contentions that timber jobs are now more dependent on changes in automation, productivity, and the level of log exports than simply on national forest timber harvest. The commonly used numbers show that in 1979 it took 4.5 sawmill workers to produce each MMBF of lumber; by 1986 it only took 2.8 workers to produce the same amount. The timber for jobs trade-off no longer exists despite the recent

high level of harvest activity as employment levels remain low compared to historical peaks and wages continue to be high in relation to other industries but depressed in real dollar terms. Last year's harvest level is further perceived to not be sustainable and represents a trend toward capturing profit today at the expense of the livelihood of future generations of Oregonians.

The ASQ is actually not the total volume expected to be taken from the forest; the timber Sale Program Quantity is more representative of total volume sold and harvested as it includes the ASQ plus other sawtimber not included in the ASQ (from lands designated as unsuitable) and submerchantable volume (fuelwood, cull, and other). The Preferred Alternative's TSPQ is set at 710 MMBF compared to an average of 784 MMBF sold in 1977-1986 and 607 MMBF cut during the same period.

The employment issue is being tied directly to the ASQ levels of the alternatives in the Plan making it one of the central issues of the review process. Inherent in the Plan and in the majority of public positions on the Plan is the contention that jobs vary directly with timber harvest. This may not necessarily be the case. There are a number of intervening variables that impact employment levels. A cursory analysis of harvest and employment found no correlation at all between WNF cuts and Primary Zone lumber employment. Claiming that a set number of jobs will be created or lost depending on a specific ASQ is a misleading use of the economic data.

Employment levels could be modified by the mixture of mills winning contracts. Some technologically advanced mills in Lane County can produce more lumber with from 1/3 to 1/2 of the workers than at some of the older mills in the county. Structural changes in the industry are evident in Lane's lumber employment history. Average lumber employment between 1977 and 1985 was 12,400; in the last two years of record production, employment has averaged only 10,550. There is no guarantee that demand for the product will require a set level of harvest through the next decade and even less of a guarantee for the next five decades. Recent national housing start projections have starts ranging from 1.54 million in 1988 (a drop from the levels of the past four years) to a peak of 1.58 million in 1991 to a low of 1.40 million in 1997.

If stable to slight increases in lumber employment is the realistic goal of the region, then perhaps what is warranted is a flexible approach to timber sales that are more responsive to changes in markets and prices. The ASQ is not meant to be an absolute annual sale level. It is a decade long average that can be exceeded in years of strong market demand and missed in years of weak demand. Not enough attention has been given to or directed at the variations possible in harvest scheduling. Alternative J, for example, could be developed with Harvest Schedule Option 3, which provides a ten-year transition in sales representing a slight departure from non-declining yield. This option would provide higher levels of timber availability early in the decade with gradual reductions later on; the make-up would occur in the second and third decades, but would lessen the employment concerns of the near term.

TIMBER VOLUMES SOLD/CUT AND LUMBER EMPLOYMENT

FISCAL YEAR	SOLD (MMBF)	CUT (MMBF)	PERCENT CUT OF SOLD	LUMBER EMPLOYMENT PRIMARY ZONE	JOBS PER MMBF HARVEST	AVERAGE SELLING PRICE $/MBF
1977	756.7	641.7	84.8	21,924	34.17	184.67
1978	755.3	693.1	91.8	22,266	32.13	218.82
1979	811.2	638.7	78.7	22,465	35.17	310.85
1980	788.8	554.0	70.2	20,103	36.29	295.38
1981	799.8	470.7	58.9	19,022	40.41	300.99
1982	730.6	370.3	50.7	16,715	45.14	104.95
1983	731.1	555.0	75.9	17,487	31.51	116.87
1984	830.5	612.2	73.7	18,781	30.68	99.49
1985	787.0	775.3	98.5	17,380	22.42	83.6
1986	853.7	758.4	88.8	16,728	22.06	116.68
DECADE AVERAGE	784.5	606.9	77.4	19,287	31.78	183.23
1985/86 AVERAGE	820.4	766.9	93.5	17,054	22.24	100.14
1987*	867.0	899.0	103.7	18,105	20.14	
1985/87 AVERAGE	835.9	810.9	97.0	17,404	21.46	

* 1987 VOLUME SOLD AND CUT FROM USFS; EMPLOYMENT DATA ESTIMATED

Limited analysis was developed in the Plan concerning the potential problems facing communities with more dependence on WNF timber than found on average for the Primary Zone counties as a whole. Regardless of harvest scheduling, there needs to be some provision ensuring that mills and communities dependent on WNF timber will receive equitable opportunity to make purchases. The problem of local community stability is often compounded by the fact that smaller mills tend to be more reliant on Federal timber. According to Western Wood Products Association data for the Western U.S. inland region in 1986, mills producing under 30 MMBF of lumber per year received over 70% of their timber from Federal lands. Firms producing less than 20 MMBF could rely on company owned land for roughly 2% of their supply compared to 22% for firms producing at least 50 MMBF.

The population data used in the Plan, especially projected population levels, tended to be outdated. For example, the Primary Zone population for 1987 was estimated at 569,200. This figure is actually lower than the 1980 Census total of 569,413 and 48,000 below the projected 1990 level. Lane County will need to add nearly 25,000 people in the next three years to meet the nearest projection. Projections for later decades are also suspect. Use of these population projections either in IMPLAN or in estimating forest demands from recreation, for example, could result in questionable outputs.

Recreational use assumptions center on the belief that future participation will increase as long as opportunities are provided and as long as underlying demand is present and continues to grow with population and with the desirability of recreational activity. The growth projections of RVDs appear to be inflated in the first two decades of the Plan. For example, RVDs will increase by roughly 67% between 1980 and 2000 while population, even using the possibly inflated projections, is expected to rise by only 25%. RVD changes projected for the remainder of the planning period are more consistent with population growth.

The employment data used in Chapter III, Section 4, "Social and Economic Environment," of the DEIS is generally accurate and correctly interpreted. The primary error is one of omission due to the fact that the latest available data at the time of analysis was 1985; thus, the analysis tends to miss important economic changes that occurred in the Primary Zone during the 1986-1987 period.

The use of IMPLAN as the model for generating job and revenue outputs for the various plans presents potential problems. The IMPLAN model assumes that the area of influence of the WNF exchanges its goods and services in a manner similar to that found nationally, and that there have been no substantial changes in the local economy since 1977 to invalidate the model's projected impacts based on 1977 data. The first assumption is common for model construction, but can be suspect to a limited degree since the Primary Zone counties tend to be much more natural resource dependent than the nation as whole implying that exchange patterns could be somewhat different. The second IMPLAN assumption is obviously suspect since the area has undergone significant changes in employment, earnings, and income between 1977 and the mid-1980s. One of the more evident changes can be seen in personal income data; during this period Lane County has experienced a 12.5% drop in the share of personal earnings from durable goods manufacturing, a 50% drop in share of earnings from construction, and a 30% increase in earnings from services, changes representative of the on-going trade-off of high-wage goods producing jobs for low-wage service producing employment.

The first decade employment change of the Preferred Alternative is set at an increase of 1,237 from the base level. The bulk of the gain (1,145) derives from the change in timber volume output with a lesser amount from payments to counties (188). The job change associated with recreation use is

estimated at a loss of 98. Recreation use reflects negative job changes in all of the alternatives except A (No Action), C, and D, both of which would severely limit timber volume. The model appears to have a bias that benefits from recreation and harvest cannot co-exist, a situation that is currently (co)existing in Lane County.

There is limited reference in the Plan to the types of employment generated by the alternatives. This may be due to the Forest Service being equally skeptical about assigning employment levels to forest management plans. Even so, of the 1,237 first decade jobs the Preferred Alternative is expected to create, less than one third (368) have been classed as direct jobs by IMPLAN. An additional 306 jobs to be added are considered to be indirect jobs with the remaining 562 jobs falling in the induced category. The direct job creation, meaning jobs in the lumber sector, of Alternative J is one of the highest of all alternatives; only Alternative B-Departure and J-Departure exceed the Preferred Alternative in direct job creation. The Departure Alternatives have higher direct job components since they depart from non-declining yield requirements causing increased output and employment in the first decades, but severely restrained activity in the latter stages of the five decade plan.

While the WNF plays a major role in the economy of the Mid-Willamette Valley, it is by no means the only player. The Plan states that no single mill could be adversely affected by the sale levels of timber in the WNF since other sources of timber are available. Unless there is a coordinated management plan for all sources of timber, including other national forests, other federal lands, state lands, and private lands, in order to determine such things as inventory of timber, availability of timber for sale, and harvest scheduling, single mills and individual communities could conceivably be adversely affected by the determination of timber sale levels from the Willamette National Forest.

Department of Transportation

PARKS AND RECREATION DIVISION

525 TRADE STREET SE, SALEM, OREGON 97310

DATE: April 28, 1988

TO: Norm Johnson
Federal Planning Coordinator

FROM: Don Eixenberger
Research Analyst

SUBJECT: Review of the Willamette National Forest Plan

The U.S. Forest Service (U.S.F.S.) plays a major role in the provision of recreation in the State of Oregon. It is an indispensable element in maintaining a diverse quality of recreational opportunity which will gain even greater importance as the state's population grows and as out-of-state tourism plays an even more crucial role in the state's economy. For example, federally administered lands provide over 30 percent of the state's campsites and picnic tables, 50 percent of its hiking and bridle trails and 60 percent of its ORV areas. Thus, while the plans assume that the U.S.F.S. provides 7.5 percent of outdoor recreation nationally, in Oregon, it is likely to be 3 to 4 times that amount if not more.

The U.S.F.S. is also the near sole provider of certain types of outdoor recreation in the state. Much river recreation and most snow activities and primitive and semi-primitive recreational opportunity are dependent on public lands managed by the U.S.F.S. Yet while demand for outdoor recreation opportunity of all types continues to grow, in many cases, the resources to provide those opportunities are shrinking. The Willamette is especially important along with the Mt. Hood National Forest, it is literally the backyard of the growing urban populations of the Willamette Valley. Its nearness to these populations provide an irreplaceable richness of recreational opportunity accessable to all elements of the population regardless of economic circumstances (e.g. the City of Eugene provides public transport to forest lands). That very nearness also insures a source of recreational opportunity against future vacillations in fuel supply. The variety of its opportunities provides a reservoir of recreational resources for the future, as valley populations continue their growth.

General Comment

There are two general issues which emerge from the Willamette Forest Plan that give cause for concern. They are the:

1. Economic valuation of recreation. *
2. Projections of recreational demand. *

Economic Valuation of Recreation

The economic values of recreational activities have been discounted by 37 percent.** In addition, recreational values have been assigned by a 0 percent per year real price trend throughout the life of the plan while a one percent per year real price trend for timber was used for harvest scheduling analyses.

We believe these adjustments to be unsupported and result in a serious undervaluation of the contribution recreation makes to Present Net Value (PNV).

These discounted values could have especially significant effects when specific areas of the forest are considered. PNV for recreation is presented forest wide, yet recreation is often feasible and/or concentrated in a specific area (e.g. an accessible roadless area, a river corridor). If an appropriate presentation of the economic benefits of recreation vis-a-vis other resource values is to be made, site or area specific analyses should be made. Otherwise there is a risk of trading of high recreation values for potentially marginal timber values.

Economic benefit analyses should be recast with recreational values appropriate to the Willamette Forest. They should also be formulated for specific areas of recreational use, especially where recreation and timber allocations may be in conflict.

Recreational Demand

The plan estimates future recreational demand using 1979 River Basin Commission data developed for the State

* These two issues are discussed in greater detail in the attachments.

** as stipulated by the 1985 R.P.A.

Comprehensive Outdoor Recreation Program (SCORP). Growth rates were then reduced to account for aging population, reduced immigration to the state and increased urban-based recreation.

While we recognize the problems in projecting recreational use, we do have some concerns with the methods employed.

First, granting the growth of urban based recreation, it is questionable whether it is reducing recreational growth on the forest. What is more likely occurring is that forest recreation is growing in diversity as well as in overall use. While growth in traditional activities such as hunting and fishing may be slowing, other activities have emerged in the last decade which may be growing faster than population. Riverboating, mountain bike riding, ORV use such as ATVs, cross-country skiing, snow mobiling and wildlife viewing are good examples of this.

Second, it appears that use of Pacific Northwest River Basin data was based on statewide projections. But the Willamette N.F. draws large numbers of visitors from the urban population centers of the Willamette Valley, extending even to the Portland metropolitan area. The valley's population is growing faster than the overall state rate. The 1983 SCORP for example shows a net need for walking and hiking trails by the year 2000 for Lane, Linn and Marion Counties, which constitute a primary service zone for the Willamette N.F.

The Willamette N.F. also likely draws significant numbers of visitors from out-of-state, who may be coming from areas with greater population growth than Oregon.

We suggest that recreation use projections take into account the varied residence nature of forest visitors.

We also suggest that the projected annual use rate of 1.40 annually across all activities for the years 2001 to 2030 be reviewed. Many of these activities will likely vary from this.

Oregon State Parks in conjunction with Washington and Idaho has recently completed a recreational demand survey which will update and revise the 1977 River Basin data. Results from this survey should be available by late fall of 1988 and will be useful in formulating new recreation use projections.

Scenic Rivers

The McKenzie River from Tamolitch Falls to McKenzie Bridge (excluding Trail Bridge Reservoir and Dam) has been found to be eligible as a "Recreational" river under the federal Wild and Scenic Rivers System. However, it is not being recommended for designation under the preferred alternative J. Considering the recognized qualities of the McKenzie, and its inclusion in Senator Hatfield's Omnibus Scenic Rivers bill, as well as proposed for state designation under the Oregon Rivers Initiative, we suggest it be recommended for consideration for designation.

The Little North Fork of the Santiam and the North Fork of the Middle Fork of the Willamette are designated as State Scenic Waterways. We believe these rivers should be examined for eligibility as candidates for designation in the federal system.

In addition, the South Santiam from its source to Foster Reservoir, is on the state inventory of potential scenic rivers. It was studied by Oregon State Parks in 1973 and found to qualify for state designation. The South Fork of the McKenzie is included in the Oregon Rivers Initiative. Both rivers were rated as having "outstanding" recreational values in "The Recreational Values on Oregon Rivers."* In the same study, the Middle Fork of the Willamette was also found to have "outstanding" recreational values. We believe these rivers should be considered for eligibility. In the interim, they should be managed so as to maintain their eligibility characteristics.

Recreational Diversity

We are supportive of management calling for a diversity of recreational opportunities as delineated by the Recreational Opportunity Spectrum (ROS). Roaded opportunities have more than double the supply needed beyond the 50 year planning horizon. The major potential shortfall on the Willamette occurs in opportunities for semi-primitive motorized (SPM) and non-motorized (SPNM) recreation.

* "Recreational Values on Oregon Rivers" Oregon State Parks and Recreation Division, April, 1987.

Under the preferred alternative, roadless areas providing these opportunities are slated to be reduced from over 209 thousand acres to about 84 thousand acres (with no harvest). According to the plan, practical capacity for projected SPM use will be exceeded in the mid 1990s; practical capacity for SPNM will be exceeded before the year 2010.

The problem on the Willamette is heightened by the fact that many of these areas are at lower elevation. As such they provide accessibility to significant portions of the population who may lack the physical ability and/or time to take advantage of the higher elevation wilderness area.

This poses a significant recreational crisis. The Willamette along with the Mt. Hood N.F. are the main providers of these recreational opportunities for the growing urban population of the Willamette Valley. As this population and urban pressures grow, the recreational opportunities provided by these lands will become more crucial as "quality of life" issues.

Once developed, the semi-primitive character of these lands would be difficult to reestablish. The U.S. Forest Service is virtually the sole provider of these opportunities in a forested setting; and similar reductions are planned by all the forests in Oregon. Consequently, substitutes for such semi-primitive opportunities will be unavailable. Through the planning horizon of all the plans, significant portions of the undeveloped lands will undergo a gradual but persistent alteration which will depart from those recreational and visual characteristics Oregonians have historically expected of their national forests.

Given the scope and depth of this issue, we suggest the following:

1. Develop a region 6 wide plan describing potential cumulative impacts of forest planning on recreational diversity and prescribing how future demand, defined in terms of the ROS, will be met.

2. Schedule road building and harvesting in the Willamette in ways allowing future options to meet the goals of such a plan.

3. Reconsider existing roadless areas on the forest. Evaluate their recreational appropriateness for semi-primitive management.

In terms of the latter, we support semi-primitive management for the following areas as described in alternative J: Bull of the Woods, Echo Mt., Mt. Washington South, Huckleberry, Frog Camp, Charlton Butte, Maiden Peak, Hardesty, Bull Dog Rock, Diamond Peak South.

We are especially supportive of semi-primitive management in the Waldo Lake Area as described in alternative J. Chucksney, Fuji, Charlton Butte and Waldo Lake form a composite in an important recreation area. However, data presented for Waldo Lake area are confusing. Figure C-24-2 states that 6,074 acres would be in management area 14, General Forest in alternative J: Figure C-24-3 places nearly all of the area in semi-primitive management or visual quality of preservation with no timber harvest. We believe the latter is the desirable management of Waldo Lake. There are a number of other roadless areas, mainly lying at lower elevations, which we believe should be considered for semi-primitive management. These include Opal Creek, Elkhorn, Middle Santiam, Gordon Meadows, Gold Creek, Mt. Hagan and Moose Lake. While some of these areas receive relatively less recreational use at present, their management for future demand would provide the forest with greater managerial options. Their lower elevation combined with longer use seasons potentially provide greater access to growing Willamette Valley urban populations. We suggest that these areas be managed for semi-primitive opportunities as described in alternative D.

Developed Recreation Sites

Under alternative J, public and private sites will be increased by 15 over current inventory. However, as the plan points out, timber harvesting may alter the availability and/or desirability of some sites. The plan should display these anticipated impacts and whether planned site construction is sufficient to both replace them as well as meet future demand.

We support the standard service maintenance levels as contained in alternative J.

We also support provisions for expansion of the Hoodoo and Willamette Pass Ski areas.

The Little North Fork Santiam canyon is increasing in recreational popularity. We believe greater facility development is needed to accommodate existing uses and to meet future demand.

Trails and Dispersed Recreation

Under the preferred alternative, out of 597 miles of existing trails, 170 miles will have "high effects" due to harvest levels and attendant road construction; 186 miles will have "moderate effects." While new trails will be constructed, it is unclear in the plan how many trails will actually be lost to recreational use due to "high" effect. While some mitigation may be possible, in many cases, the recreational characteristics of the land area for which the trail provided access, may be lost. This is apparent especially in those semi-primitive areas of the forest slated for timber management. Examples of this are the Maude Creek area containing the Crescent Mtn. Trail and the trails through the Gate Creek area. Similar cases occur along trails to popular back country lakes, such as Fay and Fir Lakes. While some of these trails and most of these back country lakes have some scenic buffers, it is not clear whether the integrity of their recreational value will be maintained.

Moreover, as mitigation is needed for the effects of timber harvest and road construction there will be fewer suitable areas remaining in which to mitigate. We suggest the following:

- Along with developed recreation and semi-primitive sites, the plan should display more clearly the cumulative impacts of timber harvest on specific trails and the recreational areas they access.

- Standards for trails and accessed areas could be developed (beyond existing marginal scenic buffers) which would allow quality classification of the forests dispersed recreational areas. In effect, such standards would allow inventories of recreational quality and more precise measures of needed mitigation.

- Explore other timber harvest and road building techniques in high quality dispersed recreation areas, such as smaller clearcuts, extended rotations, and measures to not only close roads, but construct them in

ways allowing more rapid reconversion to natural conditions.

- Consider both foreground and middle ground scenic retention along major recreation trails and quality dispersed recreation areas, especially for streams and lakes.

Scenic Viewshed

We are supportive of viewshed management along highways, recreational roads, the Pacific Crest Trail and other forest recreation trails, and in other recreational areas of the forest.

We have some concern about interpretation of visual guidelines however. An example is Highway 22, an important recreational and tourist arterial. On the west side of the summit, over the past several years large clearcuts have occurred on the north side of the highway leaving only a thin buffer, lattice-like in appearance. We feel the scenic quality through this area has undergone substantial deterioration. The extent of the harvest units and the thinness of the buffer present an awkward contrast and blemish to natural conditions elsewhere. We suggest that standards and their application be reevaluated so as to prevent further deterioration of visual conditions along such major highways.

We also have concerns about the Little North Santiam Viewshed. Under all the viewsheds described in Figure IV-10-3, only the Little North Santiam is slated under the preferred alternative to deteriorate in visual quality (from "natural appearing" to "slightly altered"). Given the Little North Santiam is a State Scenic Waterway, we believe it should be maintained in its current visual condition.

DE:jn
WILLAMET.MMO

STATE OF OREGON
TRANSPORTATION

INTEROFFICE MEMO
PLA 16-7

TO: Dave Talbot, Administrator
State Parks and Recreation Division

DATE: April 27, 1988

FROM: Gary A. Potter
Director of Administration

SUBJECT: OSHD Response to Willamette Forest Plan

Attached are comments representing Highway Division concerns regarding the above-mentioned forest plan.

Please include them in your submittal to the Federal Plans Coordinator for inclusion in the State's coordinated response.

Attachment

cc: Don Eixenberger, w/attach.
Brian Gregor, w/attach.
Chuck Stevens, w/attach..

STATE OF OREGON

INTEROFFICE MEMO

TO Chuck Stevens
ODOT Planning Coordinator

DATE 02/19/88

SUBJECT Willamette National Forest Plan

I have completed my review of the Willamette National Forest Plan. All that I have to add to Jack Bryan's comments is a point of emphasis.

The memorandum of agreement between the Highway Division and the Forest Service states that the Regional Forester will "Keep [the] State Highway Engineer informed of potential impacts to Forest Highways due to Regional and Forest plans." The Draft Environmental Impact Statement (DEIS) should have carried out this provision of the agreement, but it did not. The DEIS only describes the impacts of the various management plan alternatives on Forest Service roads.

Brian Gregor

Brian Gregor
Planning Coordinator/Environmentalist

BG:dbo

cc: Jack Bryan
Ken Norton

0219d5

STATE OF OREGON INTEROFFICE MEMO

Chuck Stevens
Policy and Planning Section

DATE: January 21, 1988

Jack Bryan
Location Liaison Coordinator

Willamette National Forest
Proposed Land and Resource Management Plan

I have reviewed the proposed Land and Resource Management Plan (LRMP) and find that, as with earlier plans, the obvious concern of the Willamette Forest people is management of the Forest as its own entity. These are my passing comments as I return the plan.

Interaction with other agencies or groups is acknowledged but not to any degree of detail, although I am encouraged by the repeated mention of inter-agency cooperation. Chapter I notes that the Forest is accessed from 200-plus miles of County, State, and Federal highways. Chapter IV, Forest Management Direction, mentions inter-agency cooperation on a general basis under Section B, Forest Management Goals. In Section D, Forest Objectives, m(3) Transportation, the Memorandum of Understanding between the Highway Division and the Forest Service Region is specifically referred to as the guide for location, construction, and maintenance of highways through the Forest as well as direction for access control, landscape management, rest areas, and right-of-way grants for highways. This same section declares the Forest's intention to continue working with County governments in the construction, reconstruction, improvement, and maintenance of certain Forest and County roads, i.e. through the Forest Highway Program (funding source).

In the discussion of Forest Management Objectives (Chapter IV, Section D), timber production over the years is projected to decrease slightly while recreational use is projected to increase. However, the segment covering transportation deals only with internal forest roads, with no mention of the need to address the effect of increased recreation on adjacent County, State, and Federal Highways or in the Sno-Park program.

Mineral Sources and Energy Sources are discussed in two areas, under Forest Management Objective, Chapter IV, Section D, 2(p), and under Forest-wide Prescription, Chapter IV, Section E, (A). Although a lessening of land available for mineral development is planned, applications for use of common materials (rock) will be considered, including those for public agencies and cooperating agencies (state and counties) and, of course, the Forest Service also recognizes its own need for road-building materials.

Maintaining an adequate supply of road-building materials is vital for the continued construction, reconstruction, and maintenance of Forest Roads and State Highways. It is important that the Forest be managed so conflicting land uses do not occur in areas of material sources.

I spoke with Ken Norton, Region 3 Planning Coordinator, about the Willamette Forest Plan. He had received a copy of the plan and was in the process of reviewing it. When he has finished his review he intends to forward the plan copy to Brian Gregor, Region 2 Planning Coordinator, for his review. I suppose you won't need to circulate your copy to them now.

I would ask that you alert the Executive Department that we of the Highway Division feel that the Statewide Responses to these Forest Plans should point out the need for coordination between the various National Forests and the Agencies responsible for the road systems connecting the Forests to the rest of the State. The detailed responses from our Regional Planning Coordinators to the individual Forest about their Management Plans have been well done and should have alerted the Forests to our concerns. I just believe that a Statewide response would be incomplete if it contained no mention of Transportation concerns.

Please call me at 378-6265 if I can be of further assistance.

JB:tjs

cc: Duane Christensen
Don Adams
John Sheldrake, Maintenance Operations Engineer
Ken Norton, Region 3 Planning Coordinator

DIVISION OF STATE LANDS
COMMENTS ON THE WILLAMETTE NATIONAL FOREST LRMP AND DEIS

(NOTE: This review responds to comment area #6 in the Governor's Executive Order, "comparison of the proposed plan to agency goals and state and federal legal requirements." The Division of State Lands has no comments regarding #1-5 and #7.)

1. Impact of the plan on state-owned land and resource management

a) Surface Property Interests

The State Land Board owns some 730,000 upland acres in Oregon. This land is predominantly in range and forest use. Most of the rangeland is in Lake, Malheur and Harney counties, while most of the forest acreage (96,000 acres) is consolidated in the Elliott State Forest. In addition, the Land Board owns numerous isolated parcels scattered over the state.

Day-to-day management of these lands is handled by two range specialists in Eastern Oregon and, in the case of the Elliott State Forest, by the state Department of Forestry under contract with the Land Board. The isolated, unconsolidated character of the remaining parcels makes them difficult to actively manage.

Some of the state-owned land base in Oregon is located in, adjacent to or nearby land owned by the federal government. In the case of the Willamette National Forest, the state of Oregon has surface property interests in approximately 775 acres of such land. Analysis of the management designations assigned to the federal lands, both under the current or "no change" alternative and the Forest's "preferred alternative," shows the following state-owned parcels to be potentially affected by forest policies:

- Sec. 16, T16S R3E - Lane County (640 acres)
  This section of land lies just northeast of the Forest, with its southeastern corner abutting the Forest boundary. Under the "No Action" alterative, the parcel borders land identified as "non-national forest." An area to the south and east is designated "research natural area - proposed." Under the preferred alternative, the proposed research natural area is enlarged. The boundary of the RNA is approximately 1/2 mile from the state-owned parcel under both alternatives.

- Sec. 36, T16S R3E - Lane County (NW¼ NW¼; 40 acres)
  This small parcel borders the National Forest on the north and west. Contiguous areas are designated "general forest" on both the "no change" and "preferred alternative" maps.

- Sec. 1, T16S R4E - Lane County (SW¼ SE¼; 40 acres)
- Sec. 2, T16S R4E - Lane County (Lot 4, 55.38 acres)
  Both these parcels are bordered on all four sides by the Willamette National Forest. Management objectives for surrounding lands are similar under both the "no change" and "preferred alternative" maps.

To summarize, our review of preferred alterative management objectives for national forest lands located contiguous to state-owned lands indicates that implementation of the plan will have minimal impact on management of the state-owned lands.

b) Land Tenure Adjustments

The Common School lands identified above are geographically isolated from other state-owned forest lands, making them difficult to manage efficiently. The State Land Board has for many years pursued a policy of consolidating its scattered and isolated land holdings to allow better management of the land in keeping with its constitutional charge to "manage lands under its jurisdiction with the object of obtaining the greatest benefit for the people of this state, consistent with the conservation of this resource under sound techniques of land management." (Section 5, Article VIII, Oregon Constitution.)

To date, most of the Board's consolidation activities have taken place in Eastern Oregon, where some 600,000 acres of state-owned rangeland are located. Since 1969, Land Board consolidation efforts have involved the exchange of over one million acres of state and federal land. The exchange program has resulted in more efficient management and more productive rangelands, and has greatly enhanced the Board's ability to meet its constitutional charge.

Although consolidation efforts of the Land Board have thus far focused primarily on Eastern Oregon rangelands, opportunities exist to improve management of forest lands as well. There remain in state ownership some 125,000 acres of scattered and isolated parcels of Common School lands. Most of this land -- some 80,000 acres -- is rangeland. The remaining 45,000 acres is forest land. Of the forest land, an undetermined amount of acreage is located in, adjacent or in close proximity to U.S. Forest Service land.

The national forest planning process offers a unique opportunity for the Land Board, acting through the Division of State Lands, to continue and expand its efforts to consolidate its land holdings. Legislation enacted in the 1987-89 session of the Oregon Legislative Assembly authorizes the division to "dispose of isolated sections and fragments of sections of state lands which are not suitable for management according to longe-range policies of the State Land Board." Acting on behalf of the Land Board, the Division of State Lands is identifying scattered and isolated parcels in and near the forests for possible sale or exchange under this law.

The Willamette National Forest LRMP and DEIS deal with the subject of land adjustments in Chapter III of the DEIS, under Section "Z. Non-national Forest Land." This section describes the pattern of non-federal ownership within and adjacent to the forest, outlines some of the problems associated with broken ownership, and briefly states the objectives of land ownership adjustments on the forest.

The LRMP itself, however, makes no mention of land tenure adjustment. Other forests have generally included ownership-related goals in their forest-wide standards and guidelines, and we recommend that the final Willamette plan do the same. We would suggest inserting a "Land Ownership" section between the "Land Use" and "Timber Management" sections on pp IV-55-56 of the plan. Suggested language for such a section is attached. Inclusion of this section will clarify the forest's acquisition/exchange priorities and promote consistency with other forest plans.

2. Comparison of the proposed plan to state legal requirements

The division administers the state of Oregon's Removal-Fill Law, which regulates the removing and filling of materials from and in the waters of the state. Filling or removal within the beds and banks of non-navigable waterways in forest lands for forest management practices in accordance

with the Oregon Forest Practices Act is exempt from regulation under the Removal-Fill Law. However, removing and filling for activities not related to forest management practices in accordance with the Forest Practices Act, such as road or bridge construction, construction of in-stream structures to improve fish habitat, and mining, are subject to the requirements of the law.

Numerous sections of the plan and DEIS refer to fish habitat and other riparian (e.g. streambank) improvement projects. To ensure that management activities are consistent with Oregon law, we recommend inserting a new paragraph 13 on p. IV-62 (Under Soil, Water and Riparian Areas in Section B - Standards and Guidelines Applicable to Specific Activities to read as follows:

13. All soil, water and riparian area management activities not related to forest management must meet the aquatic resource protection standards of Oregon's Removal-Fill Law. (ORS 541.605- 541.695).

Subsequent paragraphs would be renumbered accordingly.

b) State's Proprietary Interest in Navigable Waters

The State of Oregon holds title to the beds and banks of all navigable waters in the state. The Land Board and the Division of State Lands enforce the state's interest in these lands, primarily through the waterway leasing program.

The state claims navigability of the Middle Fork of the Willamette River from its mouth to the North Fork (RM 37.5). Approximately 12 miles of the navigable portion of the river, most of which is now submerged by the Lookout Point Reservoir lie within the national forest. On the McKenzie River, the state claims ownership up to Rainbow at River Mile 64.0. Approximately 6.0 miles of the river meander through national forest parcels between Blue River and Rainbow. Finally, the state claims ownership of the bed and banks of Clear Lake in Linn County.

A number of management areas in the plan permit mineral extraction and various recreation-related development activities. Where these activities occur on navigable waters of the state, a lease from the Division of State Lands and rent or royalty payments may be required.

The plan need not be amended to reflect the state proprietary interest in navigable waters. However, to clarify this issue a section could be added to Section A - Overall Standards/Guidelines as follows:

Navigable Waters
The State of Oregon holds title to the beds and banks of all navigable waters in the state. The State Land Board and the Division of State Lands enforce the state's interest in these lands. In the Willamette National Forest, Clear Lake, the McKenzie River to River Mile 64.0 and the Middle Fork of the Willamette to River Mile 37.5 have been claimed navigable.

Parties contacting the Forest regarding development activities in these waters shall be referred to the Division of State Lands, Salem, Oregon, for information regarding possible lease requirements. In this context "development activities" includes but is not limited to marinas, mineral extraction, hydroelectric power generation, or log raft storage.

3. Research National Areas/Biological Diversity

(Comments forwarded separately.)

ATTACHMENT

"Land Ownership" Addendum to "Specific Standards/Guidelines"

Land Ownership/Adjustment

1. The primary objective of land ownership adjustments in the Willamette National Forest is to simplify management problems and help improve multiple use management of all lands within the Forest.

2. High priority is placed on improving efficiency in administering the Forest, protecting and enhancing environmental quality, and maintaining and improving land and resource productivity.

3. Consolidation of ownerships shall be accomplished through acquisition or exchange of small parcels of interior and adjacent non-federal lands, and disposal of small isolated parcels of National Forest System lands.

4. All non-federal lands inside the Willamette National Forest boundaries, a limited amount of non-federal lands lying immediately adjacent to the Willamette National Forest boundaries and a limited amount of National Forest land shall be placed in one of the following land ownership planning groups:

Group 1 - Congressional Direction

Definition - This group includes those lands where Congress has either directly or indirectly instructed the Forest Service to retain National Forest ownership and acquire non-Federal lands for a designated purpose. Land management allocations which could be associated with the group include Wilderness Areas and Wild and Scenic Rivers.

Group 2 - Special Management Areas

Definition - This group includes those lands where the Forest Service, through the land and resource management planning process, has recognized the need for a special kind of management or determined that National Forest ownership is necessary to meet objectives. The target is to retain National Forest ownership and acquire private land as the opportunity and/or need occurs. The special land management allocations which could be associated with this group include Retention Forest, Partial Retention Forest, Mature Old-Growth Habitat Areas, Supplemental Resource Areas, and Inventoried Wild and Scenic Rivers.

Group 3 - General Forest (private)

Definition - Land in this group would characteristically be in the General Forest allocation, where management direction emphasizes commodity production. These lands could be considered for land adjustment and usually would provide most of the land involved in exchange projects.

Group 4a - Private Land Not To Be Acquired

Definition - Land in this group is highly developed and not suited for National Forest purposes. These lands would not be acquired.

Group 4b - National Forest Land Available for Exchange

Definition - This group generally includes small, isolated tracts of National Forest Lands that are situated away from contiguous blocks of the National Forest, are costly to administer, and contain no special resource features. These areas could be parts of land management allocations associated with groups 2 and 3.

Group 5 - State-Owned Lands

Definition - This group includes Common School lands owned by the State of Oregon and potentially available for sale or exchange to public and private entities. It includes lands adjacent to special management areas within the forest which could be adversely affected by sales to private parties or state-permitted leasing activities. Adjustments will be made only after careful review and consultation with the Oregon Division of State Lands, the Oregon Department of Forestry, and the Oregon Department of Fish and Wildlife.

Group 6 - Lands Needing Further Study

Definition - This group includes situations where it is determined that more intensive study and planning are necessary before land-ownership decisions can be made.

May 4, 1988

OREGON
ECONOMIC DEVELOPMENT DEPARTMENT
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Salem, Oregon 97310, U.S.A.
Telephone: (503) 373-1200
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Dr. K. Norman Johnson
Federal Forest Plans Coordinator
Governor's Office
2600 State Street
Salem, Oregon 97310

Dear Norm:

After evaluating the Draft Environmental Impact Statement (DEIS), and proposed Land Resource Management Plan (LRMP), for the Willamette National Forest, the Oregon Economic Development Department (OEDD) would like to offer a few comments on the proposed plan.

OEDD's primary goal is to provide jobs for Oregonians. Through promotion of Oregon's business climate, OEDD provides leadership, assistance, and incentives to business in order to retain Oregon's industrial base, recruit new business to the state, and create a climate that welcomes expansion and start-up business in Oregon.

In this light, our comments on the Willamette National Forest DEIS and LRMP are intended as an analysis of the plan's impacts on Oregon's industrial base in Lane, Linn, and Marion counties. Also, our comments will include some specific suggestions, requests for information, or clarification that pertain to the DEIS and LRMP.

FOREST PRODUCTS INDUSTRY

The forest products industry is the primary manufacturing employer in the three county area. According to Oregon State Employment Division information for 1986, employment in the forest products industry represents 59.0% of total manufacturing employment in Lane county; 56.7% in Linn county; and 25.1% of total manufacturing employment in Marion county. Even though there have been drops in forest product employment in recent years due to productivity gains, and even though the economies of the three county areas are diversifying into other sectors in the last decade, the industry is critical to the economic well being of the Willamette Valley and the state.

Neil Goldschmidt
Governor

Although it is difficult to separate the impacts on employment from supply of logs and the impacts on employment from improved technology and productivity, both factors, as well as product demand, influence the employment levels in the forest products industry. A very graphic example of the productivity impacts on employment levels from 1977-86 for each of the three counties is attached. Although employment levels have increased in the last couple years, this increase does not offset the reductions brought on by the recession of the early eighties and the resulting cost-reducing productivity gains.

On IV-195-203 of the DEIS, the Forest describes the anticipated consequences of the alternatives on the three county area. There is some discussion of factors like productivity and market conditions. This discussion, however, falls short of giving the reader any understanding of how important these factors are relative to other factors that influence employment levels. More discussion of why harvest levels were used to calculate employment impacts, while assuming the above mentioned factors were constant, would be useful.

The Forest also describes the job impact in terms of the total potential change relative to a historic average from 1977-85. The employment and other economic impacts as outlined in the DEIS and the appendices need to be updated and or clarified. Harvest levels and other indicators of forest products employment have changed significantly since 1985 and should be reflected in the analysis in the Final EIS (FEIS).

The change relative to the base level identified on page IV-198 of the DEIS for the preferred alternative is 1,237 jobs. A closer look at this number in the appendices at B-98 indicates that the preferred alternative will potentially impact forest products employment with an increase of 1145 jobs and impact recreation employment by a decrease of 98 jobs. The difficulty with this presentation of information is that it leaves the public with the impression that if the plan is implemented, employment levels in the three-county area may increase by as much as 1,237.

The most recent harvest levels of green sawtimber on the Willamette are 648 mmbf (1985-87). Comparing the preferred alternative allowable sales quantity (ASQ) of 568 mmbf to the most recent levels of harvest indicates a decreased level of harvest for the next decade. This would more likely have a negative impact on forest product employment in the area rather than positive.

While the Forest correctly describes the basis for its analysis, more useful information for the public would include a better discussion of the actual situation and not just the results of their theoretical impacts. As mentioned above the most recent employment information should be incorporated into the FEIS.

Other forest plans have included a chart depicting log flows and processing points in the economic zone of influence for the forest. In recent years log purchasers have been buying timber from locations farther from the processing points as transportation costs have become less of a factor in purchasing decisions. OEDD asks that current information of this nature be portrayed so that the impacts on the timber dependent communities in the area may more easily be determined.

A more thorough analysis of the various mills in the area that are dependent on the Willamette National Forest for their timber would be helpful. There is little discussion, if any, of mill capacity and the diameter class distribution needs of the mills. OEDD would like more quantitative analysis of the mills' current diameter class needs or how milling capacity in the area has changed in recent years. How many mills in the area are dependent on old growth douglas fir? How many have already retooled to handle the smaller logs? How much capacity of the mills is currently in excess of supply by diameter class? It is this type of information that will allow OEDD to evaluate more effectively the timber supply impacts of the proposed plan upon the communities in the three-county area.

Management practices have a significant impact on the forest's potential to produce high value timber. Intensive management practices that were discussed in the plan include more effective planting of improved stock, fertilizers, and pre-commercial thinning. In looking at the plans of other Oregon forests west of the Cascades, it appears that the Willamette is the least optimistic about the use of these management practices and the impact on ASQ. OEDD will need more information on the use of these techniques by the Willamette and other forests before we can best estimate the long term economic impacts on the forest products industry that they may provide.

OEDD would like more of a regional approach to the Forest's analysis of projected demand for timber. Taking a regional approach to demand due to the closeness of other National Forests and other owners will provide a more accurate picture of the impacts on Linn, Lane, and Marion counties. If possible, the supply from adjacent forests should be calculated based on their respective Final EIS land allocations and outputs.

The total harvests from all ownerships as portrayed at IV-81 is useful, however, the final EIS should incorporate the findings of studies currently underway at Oregon State University, assessing the future timber harvests from all forest ownerships in Oregon.

The Forest has identified old-growth as a major issue. It also determined that it would measure its responsiveness to the old-growth issue in terms of how many acres of "old-growth/large mature" timber was retained at the end of the second decade. The Forest, at IV-53, identifies values associated with old-growth timber including: "wildlife habitat, scenic qualities, clean water, awe-inspiring recreational and spiritual qualities, maintaining diversity of the gene pool for future stands, supplying timber of exceptional quality and value, and providing a living connection with the past."

While using acreage of old growth/large mature timber may respond to wildlife and scenic values, more information is needed beyond acreage to know whether the proposed alternative will supply timber of exceptional quality and value. Segregating the old growth category by the ages that provide the exceptional timber value (approximately 400-600 years), and identifying the portion of the ASQ for each alternative that represents this age category of old growth, a better assessment of the impact on the timber industry could be attained.

On III-51 of the DEIS the Forest states that based on a 1981 inventory, 638,600 acres are covered with old-growth and another 229,750 acres of large mature trees, which will qualify as old-growth in about 20 years. This represents 52% of the total Forest. On III-46, old-growth stand conditions are defined to include trees commonly older than 200 years. It is unclear whether the model development accurately portrayed this information. In Appendix B, page 24, the Forest indicates that "upon further analysis of the inventory plots, we found that the areas typed as old-growth did not represent an accurate inventory of this habitat type."

If the inventory data does not fit the definitions used to respond to the old growth issue, it is difficult to judge the economic impacts of the various alternatives. OEDD understands that the Forest is currently updating its old growth and mature inventory to insure that it is accurately portraying old growth for wildlife habitat and ecological purposes. It would be useful if this updated information also broke out the economic values of the old growth stands and the ASQ implications.

TOURISM AND RECREATION INDUSTRY

The tourism and recreation industry and its related services are of increasing importance in western Oregon. The portion of the local tourism dollars that is directly related to the National Forest is unknown. Of critical importance to these industries is access to recreation sites and the maintenance and improvement of tourist facilities in a manner that will meet future demands. Also of importance to the industry and to Oregonians generally is the existence of quality visual corridors and views.

Understandably, impacts upon the tourism industry are difficult to quantify. Recreation visitor use and the number of resulting dollars dispersed into the economy are good estimates at best. One thing we do know is that developed recreation and tourist facilities have a greater impact on the economy than undeveloped tourism. Tourists staying in resorts visiting well developed attractions spend more money in a community than do hikers or primitive campers. However, the draw to the more developed sites is often based on access to the more primitive areas. OEDD would like to see more discussion of this issue in the impacts analysis.

The Forest's proposed plan anticipates an increased demand for all forms of recreation: developed and dispersed. Demand for recreation is expected to increase over the next fifty years, and the preferred alternative is expected to meet this demand in some areas; yet the Forest predicts a decrease in potential recreation employment. Again, as stated in the previous section the use of a base that represents potential employment impacts without also including actual levels of recreation employment for comparison is misleading and confusing to the public.

The recreation demand projections are based on population trends and do not reflect changes in public preference for certain types of recreation experiences. The analysis in the DEIS and LRMP includes information about the forest users' preferences, however they are based on data that is out dated. The FEIS should include updated information on user preferences, especially for developed recreation facilities and winter recreation.

Figure III-M-4 of the DEIS provides a summary of the current capacity of recreation use. It indicates that outside of Wilderness, there is recreation visitor day capacity (RVD) for semi-primitive nonmotorized of 149,505 RVDs and semi-primitive motorized of 94,315 RVDs. Roaded natural dispersed recreation setting currently has a capacity of 2,880,050 RVDs. Developed site capacity currently is at 2,480,758 RVDs, (III-103,DEIS). For both types of semi-primitive recreation and for developed recreation, demand is expected to be in excess of capacity before the end of the fifty year planning period. "Even if existing inventories of semi-primitive opportunities were maintained, future use may exceed capacity shortly after the year 2000," (III-101, DEIS).

On IV-118 of the DEIS, the effects on the dispersed recreation opportunity settings are portrayed. The chart indicates the percent of each inventoried ROS category that will be managed as the same or a different ROS category. Without going through a lengthy calculation, the reader is not able to determine the percent of the inventoried ROS that will remain in that category. This information is available in the appendices at B-187, and it shows that for the preferred alternative the Forest will maintain only 32 percent of the semi-primitive opportunities.

The preferred alternative will provide for a small increase in developed sites, and as stated above, a decrease in semi-primitive sites. OEDD could not find the rationale for such a proposal given the demand is stated as it is in the plan and given the importance of these sites to Oregon's tourism industry. Trade-off analysis in terms of ASQ for those areas removed from the semi-primitive ROS category due to proposed harvest would be useful.

One method to improve the information about recreation use and expectations is through monitoring. Monitoring of recreation use should be an integral part the monitoring plan. In Figure V-C-1 of the LRMP, the Forest outlines its monitoring plan. On page V-13, and V-16, the Forest asks whether they will provide semi-primitive recreation experiences and opportunities consistent with the levels in the plan and whether the Forest is experiencing expected visitor use. However, the Forest proposes to monitor the semi-primitive recreation by changes in the road system and patterns of use of the Forest and visitor use by RIM data. This does not give enough detail to determine what will be done to quantifiably assess the demand for recreation and tourist facilities on the forest. A marketing survey to determine recreationists' preferences for type of facilities and experience would help in ongoing and future planning efforts.

Without a high quality viewshed from the high-use recreation sites and along the most traveled routes, the potential for tourism development is uncertain. The scenic quality of the areas adjacent to the sites of highest potential may well be critical to the success of tourism development efforts in the area.

OEDD's tourism marketing campaign relies heavily upon the scenic splendor of Oregon's National Forests. The natural scenic beauty for which Oregon is famous is due in large part to the lakes, rivers, and snow cap mountains that are part of the Willamette National Forest.

Scenic quality is difficult to measure. The plan's documentation of visual quality resources and how they will be managed is very difficult to follow. The Forest Service "Scenic Management System" is implemented via the use of prescription standard and guidelines to meet a particular visual quality objective (VQO). These VQOs are applied to all land management strategies. For those important travel routes and visitor sites, a high VQO of retention or partial retention and the lower VQO of modification was assigned to a specific land allocations for visual management or a viewshed.

A good method to measure the impacts of forest activities upon visual quality is to compare the present situation or current condition to the proposed future condition of those areas to be managed for visual quality. Pages IV-131-138 of the DEIS discuss the future condition of the visual resource. In particular, Figure IV-10-2 is a very good explanation of the difference between the inventoried VQOs for the forest and how it will appear under the various alternatives of the plan. However, totals for the viewsheds to compare with the non-viewshed and a grand total would help. Also, it is difficult to tell from the narrative in chapter IV whether the inventoried VQOs and the Existing Visual Condition (EVC) are the same thing.

Figure IV-10-3 on the other hand is very confusing and misrepresents what is proposed. On page IV-133, the DEIS states "...if acreages assigned to these VQOs [retention and partial retention] remain the same or decrease from current levels, the scenic quality of a viewshed is expected to change to a slightly or moderately altered appearance in the short-term (10-20 years) and potentially to heavily altered in the long-term (20-50 years)."

What is meant by current levels? If we assume that current levels means EVC or if we assume current levels means the VQO inventory, there is still difficulty with Figure IV-10-3. For the preferred alternative J, this chart indicates that seven of the Forest's 10 major viewsheds will be maintained in a natural appearing condition, (also stated in figure B-H-1 in the appendices). If we use the above quoted method and we assume that current level means the Inventory, the North Santiam, South Santiam, McKenzie, North Fork/South Fork, and Willamette viewsheds will all be at least slightly altered under the proposed alternative; not natural appearing as the chart indicates. If we assume that current level means the EVC and we use the guidelines outlined at III-110, all the viewsheds will appear slightly altered or modified.

Because as the Forest indicates visual quality will become more of an issue to the public as more and more people use the Forest and because this resource is so critical to the tourism industry, OEDD urges the Forest to correct this error or document how these results were attained.

Further graphic information would be helpful. Some forest plans include photographic examples of the various VQOs.

OEDD would like more information about the costs and benefits of different visual categories and the standards and guidelines controlling their implementation. The Forest's detailed presentation of the landscape units on the Forest is helpful. In the discussion and table about reduced yield lands at IV-33 of the LRMP, the Forest depicts the various prescriptions and their reduced yield. The ASQ trade offs associated with the visual management prescription for each alternative should also be portrayed.

The Forest does present the current inventoried visual quality objectives, the resource outputs, and their impact on timber production:

VQO	CURRENT INVENTORY	RESOURCE OUTPUTS ALT. J	DIFFERENCE	% OF FULL TIMBER YIELD
PRES.	389,486	496,400	106,914	0
RET.	232,262	86,300	(145,962)	62-84%
P. RET.	488,649	139,000	(349,649)	74-95%
MOD.	484,170	237,100	(247,070)	98%
MAX MOD.	80,841	712,100	631,259	100%

These results raise a number of questions:

1) Does the 62 percent of full yield foreground retention completely reflect the standards and guidelines for this management area? The timber yields seem high. In all cases the Forest should check that the forest planning analysis correctly reflects the standards and quidelines of each area, especially relative to restrictions on the type and rate of timber harvest.

2) If the Forest can achieve the specified timber yields in partial retention middleground and modification middleground, why were so many acres shifted to maximum modification?

3) Information portrayed in the above manner would allow the public to more easily understand the proposal.

The Scenic Management System as devised and modeled in the proposed plan provides for improving the existing condition of a view to attain a VQO if it has been damaged by man's activities in the past. It does not provide for improving a view through natural means beyond the set VQO if the VQO assigned to a particular area has been met.

This system does not provide for the situation where the EVC which is "natural appearing" today may improve over time due to natural and inherent characteristic changes in the age and makeup of a forest. The result is that a foreground area along a road, that is managed to maintain the existing natural characteristics, may be logged in the future because the VQO based upon a past forest condition has been met.

At IV-137 of the DEIS, the Forest states "Scenic quality will be retained to meet visual quality objectives by adhering to the prescribed harvest rates for the scenic allocations." This system implies that trees of an age beyond what was characteristic along the road in the year of the inventory provide a surplus of natural appearing characteristic landscape that should contribute to the harvest volume. Is it the intent of the Forest to establish a set of Standards and Guidelines that assumes there is a surplus of scenic beauty in an area that is to be managed to retain its natural appearing landscape, where nature dominates? Are the Standards and Guidelines intended to recognize the impacts of time as part of the inherent character of the landscape that provides an attractive, visually pleasing forest setting?

Figure IV-D-19 in the LRMP outlines rate of clearcuts that will appear in the visual foreground and middleground along travel routes and recreation sites. This table indicates that in areas with a VQO of retention foreground, ten percent of the area will be clearcut at any one time; the rotation age will be 200 years.

At this time OEDD is unable to assess whether these Standards and Guidelines will enable the Forest to achieve its goals as outlined above to provide a natural appearing landscape where nature dominates. Will clear cutting the entire foreground area between every two hundred years in most foreground acres result in a natural appearing landscape where nature dominates? Will eliminating those stands of trees older than the assigned rotation ages in the foreground areas, (the surplus of scenic beauty), achieve these goals? The DEIS and LRMP are unclear on this issue.

The Forest Service staff of the Willamette National Forest is to be complimented on their planning efforts and on the production of a quality document. We hope that these comments will be useful in the development of the Forest Service's final proposal and a help to you in development of the Governor's alternative.

Sincerely,

David H. Lohman

David H. Lohman
Deputy Director

DHL:dhs

Attachments

STATE OF OREGON INTEROFFICE MEMO

K. Norman Johnson
Federal Forest Plan Coordinator

DATE: April 21, 1988

Ann Hanus, State Economist
Executive Department, Office of Economic Analysis

Summary of Findings and Recommendations for the Willamette National Forest Plan -- DRAFT

The Willamette National Forest is, by far, the largest national forest in Oregon. It covers over 1.7 million acres and stretches for 110 miles along the western slope of the Cascade Mountains. It lies within Lane, Linn, Marion, and Douglas counties. Of the total 1.7 million acres, over 380,000 are dedicated for wilderness. Other dedicated areas include the H. J. Andrews Experimental Forest, the Oregon Cascades Recreation Area, the Lamb Butte Scenic Special Interest Area, and four Research Natural Areas.

The Forest provides a variety of recreational opportunities and records nearly three million Recreation Visitor Days (RVD's) annually. Residents of Lane, Linn, and Marion counties are the primary users, although Benton, Polk, Yamhill, Clackamas, Multnomah, Washington, and Deschutes counties' residents are active on the Forest as well. The Forest's approximately 400 lakes and more than 2,700 miles of perennial streams and rivers offer outstanding fishing and boating opportunities. Hiking, camping, downhill and cross country skiing, mountain climbing, and motorized recreation are popular.

The Forest ranks as the number one timber producer of the 156 National Forests in the United States. According to the Forest Service, the Willamette National Forest produces about eight percent of all timber cut on National Forest lands and yields an average of 750 million board feet of timber annually.

The Forest Service defined the primary zone of influence of the Forest as Lane, Linn, and Marion counties. A secondary area of influence has been identified as the counties of Clatsop, Columbia, Multnomah, Yamhill, Benton, Douglas, Deschutes, and Jefferson counties.

The Regional Economist's analysis (attached) provides a good overview of the regional economy. The region has experienced an improving economy over the last four years, after suffering the worst downturn since the Great Depression. Annual average unemployment rates during 1987 fell to their lowest levels for the past decade (Lane County's 5.7 percent rate was the lowest annual average since 1969). Only Marion County has surpassed prerecessionary (1979) employment levels; Lane and Linn counties have achieved only 98.8 percent and 94.4 percent, respectively, of prerecessionary levels.

The three counties rely more on the lumber and wood products industry than the state as a whole. Together, the counties have 8.4 percent of their workers in the lumber and wood industry compared to 6.2 percent statewide. Linn and Lane counties are the most dependent among the three. Linn and Lane counties have 16 percent of their manufacturing jobs in the lumber and wood industry, respectively.

Over 98 percent of the total harvest from the Willamette National Forest is processed in Lane, Linn, and Marion counties. Of the amount processed in the three county area, about 66 percent is processed in Lane County, 27 percent in Linn County, and seven percent in Marion County. The percent harvested by county is similar to the percent processed.

From 1977 to 1986, the lumber and wood industry has declined in terms of employment and as a percentage of total payroll. In 1977, lumber and wood payroll amounted to 16.3 percent of total payroll. By 1986, its share declined to 11.0 percent. Furthermore, average pay per lumber and wood worker rose over the time period, but at a pace slower than the consumer price index.

The three counties have become more diversified since 1970 with lumber and wood employment shrinking and retail and wholesale trade and services rising as a share of total employment. This trend mirrors the national and state economic patterns.

The Forest Service selected Alternative J as its preferred alternative. The Forest Service described Alternative J as an alternative which will "balance the timber, roadless area, old-growth, fish and wildlife, and scenery issues in a way that provides some degree of resolution for each." The amount of land allocated to timber production is reduced from the 1977 plan levels to accommodate additional allocations to roadless prescriptions. About 32 percent of the currently unroaded areas will be maintained in that condition to provide semiprimitive recreation opportunities and to retain old-growth.

The Forest Service proposes an Allowable Sale Quantity (ASQ) of 568 Million Board Feet (MMBF). According to the Forest Service, the number of jobs would rise by 1,237 if compared to the 1977-1985 period, but would drop by 2,879 if compared to the No Change Alternative. Total Personal Income (in 1977 $) would rise by $3.8 million compared to the 1977-1985 period. Payments to counties would average $28 million per year in the first decade. The Forest Service would require a total budget of $45.6 million (in 1982 $) to implement the plan in the first decade.

According to the Forest Service job changes from the base level (1977-1985) by output are:

Recreation Use	-98
Federal Expenditures	1
Payments to Counties	189
Timber Volume	1,145
Total	1,237

The plan would directly affect 368 jobs, causing indirect job changes of 306 and induced job changes of 562.

Comments

1. The proposed ASQ of 568 MMBF is 69.0 MMBF or 10.8 percent lower than the 1978-1987 average annual sale quantity of 637 MMBF. Compared to

the harvest, the proposed ASQ is 62.0 MMBF higher than the 1978-87 average annual harvest. Recent years' harvests have been considerably higher, averaging 620 MMBF in 1985, 606 MMBF in 1986, and 718 MMBF in 1987 (Table 1). This recent higher harvest is due to a strong wood products market and harvesting of buyback volumes from the early 1980's. The proposed ASQ is also 80 MMBF lower than the 1985-87 average harvest of 648 MMBF.

Since the proposed ASQ is lower than both the 1978-87 average sale quantity and the 1985-87 average harvest, employment will probably drop below recent levels. Applying the Willamette National Forest IMPLAN coefficient of 9.55 jobs (includes direct, indirect, and induced jobs) per million board feet would mean employment losses of 659 using a 1978-87 base or down 764 for the 1985-87 period.

Table 1

Willamette National Forest Timber Sales and Harvest
Net of Cull
(Comparable to Allowable Sales Quantity)
1978-87
MMBF

	Sales	Harvest
1978	604	554
1979	649	511
1980	631	443
1981	640	377
1982	585	296
1983	585	444
1984	665	490
1985	630	620
1986	683	606
1987	694	718
1978-87 average	637	506
1985-87 average	669	648

The timber industry underwent immense change from 1981 through the present. The severe economic times of the early 1980's forced many mills out of business. Many of the remaining mills were refitted with updated equipment that provided for large productivity improvements; consequently, employment gains were held down despite record harvests of the last two years. The Forest Service IMPLAN coefficients were estimated based on 1977 data which does not capture the productivity improvements of the last decade. As a result, the IMPLAN coefficients may overstate the employment impact.

On the other hand, the timber job coefficients was 9.55 jobs per MMBF, of which 2.9 were direct jobs. According to an analysis of Oregon timber harvest reports and Oregon covered employment data, each million board feet of timber harvested was found to account for

more than six direct jobs. This estimate could be conservative because it does not include proprietors which are excluded from Employment Division statistics. Further, it does not account for the relatively large proportion of Willamette National Forest timber which is used for the labor-intensive production of plywood and veneer.

2. Since the ASQ is a significant reduction from the 1978-87 sales quantity and 1985-87 harvest levels, local governments will probably witness lower federal forest payments. County payments will probably be lower than estimates by the Forest Service unless prices rise considerably above Forest Service assumptions.

3. The population data used in the Plan, especially projected population levels, tends to be outdated. For example, the Primary Zone population for 1987 is estimated at 569,000. This figure is actually lower than the 1980 Census total of 569,413 and 48,000 below the projected 1990 level. Lane County will need to add nearly 25,000 people in the next three years to meet the nearest projection. Projections for later decades should be revised accordingly.

4. The employment data used in Chapter III, Section 4, "Social and Economic Environment" of the Draft Environmental Impact Statement (D.E.I.S.) is generally accurate and correctly interpreted. This information should be updated in the Final Environmental Impact Statement to include more recent data.

5. More information should be provided on the economic impact of recreation. While much was written on recreation use according to the Recreation Opportunity Spectrum, little analysis was attempted to provide valuation numbers and to determine the economic impact of recreation. The Umpqua National Forest, for example, attempted to quantify the value of recreation. Since recreation is an important use and is second to the timber industry in economic impact to communities, more analysis on this subject is warranted.

6. Recreation use reflects negative job changes in all of the alternatives except A (No Action), C, and D; the latter two alternatives severely limit harvesting. The model appears to have a bias that benefits from recreation and harvesting cannot co-exist. More justification should be given.

7. Recent data indicates that about six percent of the timber sold on the Willamette National Forest is processed at mills in Southwest Oregon, almost all of it in Douglas County. The Forest Service should add Douglas County to the primary zone of influence for analytical purposes. Shortages of timber may result in timbershed boundaries becoming more elastic and areas of economic influence broader as competition for timber becomes more intense.

8. The Forest Service should include IMPLAN job, personal income, value added, and local business tax response coefficients in the appendix. It appears that these values were omitted.

9. The Willamette constructed its IMPLAN model by removing part of the selling value of the stumpage to account for leakage from local economies to the Federal Government for stumpage. Inadequate documentation is given to determine if this is technically correct or if the IMPLAN coefficients are reasonable. The Willamette should correct its analysis to make it consistent with the majority of Oregon National Forest Plans. It appears that the Umpqua and the Willamette were the only two Oregon forests to use this procedure. This different procedure makes employment and income comparisons among Oregon Forests inaccurate because the coefficients are not comparable.

   The Forest Service should document whether an adjustment was made for stumpage that was returned because of contract relief, or was defaulted on, or processed unprofitably.

10. The Forest Service will be releasing its final guidelines for the Spotted Owl in the near future. If these guidelines significantly change the land allocations and proposed management under the new plan, the regional economy will be affected.

11. In addition to revealing the effect on county revenues, the Forest Service should also estimate the effects on timber harvest taxes, public road use fees and taxes, and property taxes. These revenues are important sources for local governments and schools.

12. Over the past decade, the primary impacts on industry employment have been technological changes affecting basic milling operations, economic cycles, and the expansion of remanufacturing operations. These factors will continue to be important, but timber supplies will play a more critical role. Increasing competition among mills has evolved because of diminishing supplies from nearby forests and private lands. The timber industry could face a supply gap due to projected lower harvests from private lands over the next 10 to 20 years together with proposed lower National Forest harvests. The degree to which declines in private and public lands overlap in the years ahead will have significant implications for the total timber supply available to mills. The mills could face higher stumpage prices as a result.

13. The Forest Service should boost its monitoring of local economic conditions to include employment by sector and county, unemployment, population, and personal income.

14. The economic outlook is clouded by proposed harvest level changes by national forests and Bureau of Land Management lands. A projected fall down in private land harvests, huge amounts of California and Oregon salvage from the 1987 fires, log exports, and increased inter-regional competition, further complicate the analysis. The complexity of this situation underscores the reason why a final decision about any of the Forest Plans should not be made until a cumulative analysis has been completed and reviewed.

15. The Forest Service should revise their comments about exports to the Pacific Rim counties. The Forest Service states that "projections of exports to the Pacific Rim countries show a continuing slow economic growth" (D.E.I.S., p. III-189). In light of large export increases over the last year and the falling dollar, export prospects look very bright. Further, Japanese housing starts may equal or exceed U.S. housing starts, thereby keeping the demand for Northwest wood products high.

16. Projections about the Southern timber supply should be corrected. The paragraphs at the bottom of p. III-181 and the bottom of p. III-189 are contradictory.

17. Figure III-W-12 should be updated to reflect more recent trends in the Forest Products Industry. The year 1982 was the trough in the recession; the D.E.I.S correctly notes that many mills have reopened since that time.

18. The proposed plan may result in additional restrictions on mining. According to the Forest Service, the more restrictive land allocations tend to place a higher emphasis on the protection of visual values, dispersed recreational opportunities, or special and unique wildlife habitats. As a result, use periods, surface protection measures, and rehabilitation requirements may be more restrictive. In these areas, there may be limited access because of the lack of timber harvest or other resource developments. Restrictions may vary for some management prescriptions depending on the level of management particularly those management prescriptions which include riparian areas and lakeside zones. Access may be limited depending on the existing roads and trails (see D.E.I.S., p. IV-186).

    Most of the mining activity on the Willamette National Forest has been for gold and silver with some interest expressed for oil and gas.

ANH:slf
9057j

Attachment

cc: Fred Miller
Jon Yunker
Don Steward, Employment Division
Mike Staten, Employment Division
Ken Rocco, Employment Division
Earl Fairbanks, Employment Division
Governor's Council of Economic Advisors

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DRA

General File #7-2-3-300

MEMORANDUM

SUBJECT: DEPARTMENT OF FORESTRY REVIEW OF THE WILLAMETTE NATIONAL FOREST PLAN

TO: K. Norman Johnson, Federal Planning Coordinator

FROM: James E. Brown, State Forester

DATE: April 20, 1988

Attached is the Department of Forestry's review of the Willamette National Forest Draft Environmental Impact Statement and Proposed Land and Resource Management Plan for use in the State of Oregon's coordinated response to the USDA Forest Service.

The primary emphasis of the Department's review is to insure that the Willamette National Forest plan provides an acceptable balance of environmental and economic conditions. A primary measure of the economic performance of the plan is the level of timber harvest which supports jobs and local government.

Our review has concluded that the potential exists to meet the needs of the Willamette's resource users as well as the goals and objectives of the Board of Forestry's Forestry Program for Oregon. The Department's review points out opportunities to achieve this potential. Areas where further analysis should be provided for public review in the Final EIS are also indicated. Special emphasis should be directed toward how the Willamette will manage its land to meet the future needs of Oregonians.

The Department of Forestry looks forward to working with the Governor's office, other state agencies, the Forest Service and the people of Oregon in developing a sound, balanced plan for the Willamette National Forest.

JEB/BB
Attachments

4/22/88

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General File
7-2-3-300

OREGON STATE DEPARTMENT OF FORESTRY
REVIEW OF THE WILLAMETTE NATIONAL FOREST'S
DRAFT ENVIRONMENTAL IMPACT STATEMENT AND
PROPOSED LAND AND RESOURCE MANAGEMENT PLAN

The Oregon State Department of Forestry's Resource Planning Section, in cooperation with other Department staff, has reviewed the Willamette National Forest's Draft Environmental Impact Statement (DEIS) and Proposed Land and Resource Management Plan (LRMP). Our comments focus on five areas of importance:

1. Comparison of the DEIS alternatives with the basic objectives of the Board of Forestry's Forestry Program for Oregon found on page 1.
2. Coordination with Department of Forestry programs starting on page 2.
3. Effects of the Willamette's modeling assumptions and proposed activities on timber yields beginning on page 3.
4. Economic considerations beginning on page 13.
5. Needed clarification of planning direction starting on page 20.

A summary of this review is provided on page 26

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COMPARISON OF THE DEIS ALTERNATIVES WITH THE BASIC OBJECTIVES OF THE BOARD OF FORESTRY'S FORESTRY PROGRAM FOR OREGON

(DEIS, page II-98-100) The Oregon State Board of Forestry's 1982 Forestry Program for Oregon (FPFO) contains three basic objectives for the management of national forest lands. They are:

1. Maintain the maximum potential commercial forest land base consistent with other resource uses while assuring environmental quality.

2. Identify and implement economically feasible levels of intensive forest management required to achieve cost effective growth and harvest.

3. Maintain community stability by considering the projected timber harvests from other ownerships in setting the harvest from national forest lands.

The Department of Forestry appreciates the discussion in the DEIS devoted to comparing the forest's alternatives to the Forestry Program for Oregon. Overall, the comparison shown in figure II-E-II correctly depicts the relationship between the Willamette and the State of Oregon target levels. The objective of this analysis is to compare the State's anticipated social and economic output levels with those proposed by each national forest.

This comparison shows that few of the alternatives fully meet all three objectives. The primary reason for this result is the continued reallocation of commercial forest land since the current plan in each alternative to management strategies that either prohibit or constrain timber management opportunities below the full yield potential. Only alternatives B-Dep and J-Dep come the closest to meeting FPFO desired objectives.

COORDINATION WITH DEPARTMENT OF FORESTRY PROGRAMS

Fire and Smoke Management - (DEIS III-58) The Department of Forestry supports a policy of applying aggressive suppression action to wildfires that threaten life, property, public safety, improvements, or investments. The plan correctly identifies the importance of a coordinated effort between

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State and Federal agencies in fire management.

After reviewing the sections in the plan regarding smoke management (DEIS III 33-37 and IV 46-47), the Department believes that some of the information presented in the plan is outdated. In particular, the discussion describing the Oregon Smoke Management Plan should be revised in the Final EIS. Compliance with this plan is essential because the Environmental Protection Agency (EPA) has approved Oregon's plan as meeting the requirements of the Clean Air Act as amended.

Oregon Forest Practices Act - (DEIS, IV-36) The Oregon Forest Practices Act provides minimum standards for soil and water protection and for the maintenance of forest productivity. The EPA has designated the Forest Practices Act as the "best management practices" necessary to protect fish life and water for domestic uses and as meeting the requirements of the Clean Water Act as amended.

In order to demonstrate consistency with the Clean Water Act, the Willamette Final EIS should discuss how the alternatives will satisfy the requirements of the Forest Practices Act. Particular attention should be given to the newly adopted rules for riparian area management. The forest's standards and guidelines for riparian areas should reflect the full intent of the Forest Practices Act as well as demonstrating consistency with the approved rules.

EFFECTS OF MODELING ASSUMPTIONS AND PROPOSED ACTIVITIES ON TIMBER OUTPUT LEVELS

Minimum Management Requirements - (App. B-103, H)
The Board of Forestry has recognized in the Forestry Program for Oregon that forests are important for providing a full range of uses and benefits including wood production, water quantity and quality, recreation, wildlife, fisheries, and forage. As a result, the Board has adopted a policy to encourage and promote forest management practices which will maintain and enhance the full range of social and environmental benefits of the forest.

Based on this Board policy, the Department of Forestry supports the maintenance of viable populations of indigenous forest plants and animals. It is therefore appropriate that the U.S. Forest Service provide a minimum level of protection for forest resources in its national forest plans and present the public with a range of alternatives which meet or exceed this minimum level.

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However, the Department believes that two basic improvements in the application of minimum management requirements (MMRs) proposed for implementation by the Willamette or the proposed revisions suggested by the Regional Office are needed. First, there is a need for further documentation and analysis by the Forest Service. Second, increased public involvement in the MMR decision making process must be permitted.

Please consider the following specific concerns and recommendations:

Need for Further Documentation and Analysis

1. Data Uncertainty - The credibility of the plan could be increased significantly if the MMR's were submitted to peer review. That review would help assure that the most current data and a broad base of professional expertise are reflected in the plan.

2. Alternative MMR Strategies - Only one set of MMR strategies is proposed in the plan and the sensitivity analysis provided in Appendix H only varies the intensity of that one set. Where alternative methods for achieving the same objectives are available, displaying them would be beneficial and possibly avoid later conflicts with NFMA and NEPA public disclosure requirements.

3. Inconsistency Among National Forests - Based on the information provided in the forest plans published in Region Six to date, it appears that similar national forests may be modeling their MMRs differently, thereby providing inconsistent levels of protection and inconsistently applying constraints on other resources. No published documentation supports these differences or explains how each forest's MMR package provides for the minimum level of protection, as required or suggested by NFMA. If alternatives are displayed, as recommended in number 2 above, this concern would be overcome.

The need for and design of each MMR should be clearly explained in the forest plan. A display similar to the August 22, 1984 Wildlife MMR matrix produced by the Region should be included in the Final EIS. This now outdated matrix provided important data on the number of habitats being designated by each national forest for each indicator species, the acres of suitable land involved, and a measure of the effect of these allocations on timber management. Similar displays could be constructed for soil, water quality, and riparian MMRs.

Increased Public Involvement in MMR Decisions

1. Public Review - The decision making process consists of two elements:

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a. The identification of the level of protection or management that will be the "minimum level" target suggested by NFMA.

b. The methods chosen to effect this level of protection and management.

In the Willamette's planning process to date, these decisions and assumptions used in developing the MMRs were finalized and incorporated into all alternatives without the provision of any opportunity for full public review, as required by NEPA and NFMA. This action by the Forest Service makes the planning process vulnerable to legal challenges and prevents the agency from gaining the valuable input that the public and other resource professionals could have provided the Forest Service.

The process for implementing MMRs must be opened up fully to public review. By doing so, the Forest Service may be able to develop new alternatives that are more responsive to public concerns.

2. Legal Sufficiency - Minimum management requirements were developed by the Forest Service based on the Region's interpretation of the NFMA requirements. Other parties, including other Forest Service Regions, have interpreted these requirements differently. Unless the Forest Service improves the analysis of MMRs by adequately considering the concerns of environmentalists, forest industry representatives, and other parties, litigation of the MMR issue seems likely.

Snag Management - (DEIS, IV-94) It seems that the FORPLAN model was only given one option for snag management on lands suitable for harvest, 60 percent of the biological potential. No additional choices were permitted. The DEIS provides no explanation for this enforced inflexibility in the model nor the impact on timber harvest or other outputs of applying the 60 percent level.

The plan has not presented the cost in terms of present net value and allowable sale quantity of maintaining a lower or even higher level under each management strategy. If a higher snag habitat potential can be provided on all lands without a reduction in timber harvests, wildlife habitat or a significant increase in fire risk, the Department of Forestry would support such a modification. The Final EIS should contain a discussion of the effects of applying 20, 40, 60, and 80 percent snag levels.

The Willamette National Forest should continue to insure that its methods for providing snag habitat at or above the MMR level are as efficient as possible and that the chosen

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methods are the least constraining on timber management.

Two Forest Service publications, Wildlife Habitats in Managed Forests and Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington, discuss ways of providing snag habitat while minimizing the effects on timber management. Please consider these points:

1. High stumps may provide adequate habitat for some species.

2. Emphasizing snag retention downslope from roads protects snags from firewood cutting.

3. Selecting individual trees or small clumps of trees for snag retention or snag creation may be preferable to imposing a long rotation over a larger area, especially in terms of the effects on timber harvest levels.

4. The selection criteria for replacement snags should include the economic value of the tree. Limby, deformed, and broken topped trees should be selected over sound, straight, clear boled trees if wildlife habitat is the purpose for retention.

5. Areas unsuitable for timber management should be managed to provide 100 percent of their snag habitat potential. Active management can include the creation of snags to achieve this potential, custodial management can not.

6. The time period over which the snag management goals are achieved should be considered. Requiring immediate compliance with a higher snag level can result in high first decade costs, especially where stands have been salvaged heavily in previous years.

Also note that the 1987 Oregon Legislature has passed HB 2152 which removes the requirement in Oregon law that snags be felled within 250 feet of the exterior boundaries of harvested units planned for burning. This change in the law should allow the Forest Service and other landowners more flexibility in retaining wildlife snags in clearcut harvest units.

Unroaded Area Allocations - (App. C) The Oregon Wilderness Act of 1984 stated that unroaded areas that were not designated as Wilderness should be managed for multiple-use and that management for future Wilderness consideration was not necessary. In keeping with the intent of this law, the Department of Forestry recommends that unroaded lands which support productive, manageable forest land be returned to the suitable land base and that the timber volume from these productive lands be included in the regulated timber harvest

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schedule.

The Willamette DEIS states that 209,845 acres of unroaded area exist on the forest. From this total, 32 percent (67,700 acres) will remain unroaded while 41 percent (87,000 acres) will be assigned to allocations in which roads will be constructed in the area, but where no planned activity will occur for 15 years. When these sites are added to the almost 381,000 acres of designed wilderness, some 32 percent of the total forest would be in an unroaded status through the next 15 years. A closer examination of the proposed unroaded area allocation notes the following observations:

1. It appears that the Willamette is not complying with the intent of the Oregon Wilderness Act of 1984 when allocating certain portions of unroaded areas to a nondevelopment status. A review of the maps in Appendix C notes that some of the areas (French Pete, Mt. Washington west and south, Mt. Jefferson north and south plus other sites) are small remanents that remained after the Oregon Wilderness Act of 1984. Since these reminant sites were evaluated and released, they should be returned to multiple use status.

2. It is difficult to determine the actual effect on the ASQ of retaining the unroaded areas, particularly those sites that will be only partially retained in an unroaded condition.

3. By allocating 87,000 acres of currently unroaded areas to a roaded prescription, but not permitting development for 15 years, the Willamette is continuing to delay the long awaited decision that determines the status of these remaining unroaded areas. It is in the publics' best interest that a decision be made now.

4. How can the state be assured that the Willamette will in fact initiate multiple use management on sites released from unroaded status in the proposed plan? We are concerned that the forest will continue to ignore the question, perpetuating the condition of no management on these sites which have been released for multiple-use management.

After analyzing the forest's proposed plan for retaining unroaded sites, the Department supports unroaded status for those areas which have been determined to be unsuited for timber management due to low productivity levels.

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Population Growth Levels - (DEIS, III-208) The forest's projected annual increase in the population growth rate may be somewhat high. Using the same publications that the forest utilized, the Center For Population Research and Census at Portland State University noted a 3 percent decline in population for Lane County and a 2 percent drop in Linn County occurred between 1982-1986. Marion County on the other hand had a population that fluctuated in this period, with an overall less than 1 percent gain. The Department believes that the population gain projected by the Willamette may be overly optimistic thus resulting in the continued decrease in the available, commercial forest land base due to land being allocated to other uses. The Department encourages the Willamette to use the most current population projections from PSU in the Final EIS.

Fertilization - (DEIS, II-97, IV-4) The Willamette plan has briefly discussed the fertilization program. Recognizing that only 30 percent of the lower slope soils of the Douglas-fir/hemlock zone have been trial tested, additional analysis will be necessary to identify other soil and vegetative types which will respond positively to fertilization. The forest should further consider fertilizer test responses done by both public and private forest managers on adjacent ownerships.

The Willamette has not considered the benefits of a second fertilizer application which could potentially increase growth in younger stands. Research has shown that recurrent applications of fertilizer are cost effective and that a fertilizer application is most cost-effective approximately 10 years prior to final harvest. The costs and benefits of multiple fertilizer applications should be considered in the Final EIS.

We would question the forest's decision to decrease its frequency of commercial thinning in light of recent research regarding fertilization. With enhanced growth expected from fertilization, thinning frequency could be increased with cutting cycles shortened.

Increase in timber growth would also benefit nontimber resources such as visual and mature conifer habitat management since the tree size criteria for these prescriptions could be met at a younger age. Without an analysis discussing this potential, it is impossible to judge the adequacy of the forest's assumptions.

Insect Epidemics - (DEIS, page III-81) The DEIS has presented a limited discussion on insect and disease related problems on the forest. With an older aged forest and the increasing number of acres which prohibit or reduce timber management, future epidemics are likely. Although these epidemics may originate on unmanaged lands, they can threaten

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all forest lands, regardless of land allocation or ownership. How is the likelihood of future insect epidemics and the dramatic changes that accompany them, to be used in making the final plan decision?

The DEIS should provide information on the current western spruce budworm epidemic which is spreading westward from the Deschutes National Forest. While the major epidemic seems to be centered east of the Cascades, defoliation is beginning to show on the Willamette National Forest.

Further information should also be included in the Final EIS on the gypsy moth infestation which occurred within the Willamette National Forest boundary. In spite of the serious impact of this insect on the marketing of forest products, including Christmas trees on private land, the forest has only made a token effort to explain how they will handle this difficult problem in the future from insects and diseases.

The Department of Forestry recommends that the Willamette continue to utilize, and seek funding for, integrated pest management techniques and that intensive forest management practices be implemented at levels that will help prevent future losses.

Visual Management - (DEIS, page III-107, IV-131) The Willamette has chosen to impose constraints for visual management in every alternative. Some 69,474 acres of suitable forest land will have reduced harvest levels due to visual constraints. The resulting potential yield reduction from the visual constraint has not been identified in the planning documents. Correspondence with the planning team noted that the modification middleground management area could have a one or two percent decrease in the ASQ. If this is the case, what will be the impact on the ASQ of the more stringent visual constraints required in management areas 11d, 11e and 11f?

Like the MMRs previously discussed, the standards and guidelines for visuals have been implemented without public review and without exploration of alternative strategies or an adequate tradeoff analysis.

Because timber outputs are directly affected by these requirements, the Department requests that the following information be provided in the Final EIS.

1. Analysis of the impact that visual management will have on the ASQ by alternative.

2. A summary of the costs, in terms of present net value and ASQ, of the minimum level of visual management included in DEIS alternatives.

3. An analysis of the tradeoffs that would occur if the

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visual management constraints were increased, reduced, or eliminated.

4. An analysis of how increased use of uneven-aged management (e.g., small group selection) in visual designated management areas would affect the need for these constraints.

5. An explanation of how the diameter and harvest dispersion requirements were selected and an analysis of the tradeoffs that would occur should different requirements be used.

6. A summary of the anticipated recreation use of the secondary roads that are designated for visual management.

Harvest Cutting Methods - (LRMP IV-37, App. F) The Department of Forestry supports the flexible, site specific approach to the selection of harvest cutting methods required by the Regional Guide and presented in the appendix of the plan. The Willamette is encouraged to maintain this flexibility in the forest plan. When determining the harvest cutting method, economic benefits to the forest and the timber purchaser should be considered as well as logging feasibility, stand characteristics, silvicultural response, insect and disease control and the effects on other resource values.

Uneven-aged management should be considered to maintain timber yields in those areas (i.e. viewsheds and riparian areas) where clearcutting is proposed to be limited or prohibited to accommodate or benefit other resource uses. While the plan generally supports this concept, the projected annual treatment by harvest method schedule found on page IV-37 of the LRMP reflects no acres being allocated to uneven-aged management.

The Department of Forestry recognizes that uneven-aged management is more difficult to implement than even-aged management. However, this added difficulty should not affect the choice of harvest cutting methods. We also recognize the hazards from application on species composition changes and the insect and disease effects that may result.

This decision should be based on what is best for the forest resources in light of the issues identified by the public. We recommend that the Willamette develop a comprehensive plan for utilizing uneven-aged management in riparian, scenic or other special use areas where use of that management method will permit harvesting and management for insect and disease resistance while maintaining the special values that are present.

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Desired Future Condition of the Forest - (LRMP IV-5) The Department of Forestry questions the statement that the most noticeable change in the first decade of the plan will be the development of unroaded areas. Only 26 percent of the existing unroaded areas will be released for management under the preferred alternative. With only partial management of many of these areas, a limited impact to the forest would be anticipated.

It seems that the Willamette National Forest has taken an uncompromising position on the future management of the forest. While it is essential that resource values be retained, the Willamette seemingly has ignored the impact that the plan will have on the economic stability of the area.

In order to maintain the many multiple uses of the forest, we encourage the Willamette to develop innovative approaches to managing the forest which would maintain the harvest levels while protecting the other resource values. Where feasible, single use management must be replaced by a balanced, multiple-use plan to meet the demands of the citizens of Oregon. A clear statement of the desired future condition of the forest towards which the plan will work is vital to a clear public understanding of the Willamette's management intent.

Departure From A Nondeclining Even Flow Harvest Schedule - (DEIS, II-17) 36 CFR Part 219.16 provides direction to the Forest Service on utilizing timber harvest schedules in alternatives which depart from a nondeclining evenflow schedule. Such alternatives are to be "...evaluated if it is reasonable to expect that overall multiple use objectives would be better attained". Regional direction goes on to require consideration of departure alternatives in the following situations:

1. When losses from insect attacks can be reduced.

2. When fire risks can be reduced.

3. When timber harvests from other ownerships are expected to decline.

4. To better meet range and wildlife goals.

5. When the species mix of timber harvests on all ownerships is changing in a way that could adversely affect the economies of local communities.

6. To meet Forestry Program timber harvest targets.

Most of these conditions exist on the Willamette National Forest. Collectively, they point out the necessity for a departure harvest schedule to be given serious consideration

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in the decision making process.

The Willamette has formulated departure alternatives B and J which increase first decade timber harvests. A 36 percent reduction in ASQ between the third and fifth decades proposed in both departure alternatives, however, could create social and economic instability in the local economy. We suggest that departure schedules should be regulated by a 10 percent decadal harvest change constraint to avoid this disruption.

The Department recommends that the Willamette consider a more aggressive salvage program for all the alternatives. In this manner, an increased volume could be retrieved from lands prior to the scheduled harvest. Considerable quantities of this material would otherwise have decayed before the final harvest was initiated. The plan should portray the salvage program's anticipated cost and benefits, including an approximate decadal volume estimate.

Culmination of Mean Annual Increment - (App., B-136) Region 6 has implemented a minimum management requirement, based on Forest Service regulations, that even-aged stands scheduled for harvest will generally have reached the culmination of mean annual increment of growth (CMAI). The constraint, when combined with the nondeclining even flow requirement and the existing Willamette National Forest timber inventory, significantly reduces the ASQ of the DEIS alternatives. Removal of this constraint would allow the model greater flexibility in selecting prescriptions which could result in greater harvested volumes, returns to counties and greater present net values.

The Department suggests that the Willamette consider the following possible solutions to this problem:

1. Shorten rotations only during the critical decades.

2. Increase intensive management practices in those stands planned for harvest during decades 6 and 7.

3. Coordinate the Willamette's harvest schedule with adjacent national forests and other public ownerships. These other forests may be able to depart from NDEF during the decades that the Willamette has an inventory shortage.

4. Use the FORPLAN model to maximize timber output by allowing timber harvests to vary within a plus or minus 10 percent range by decade. This would permit the model to more efficiently deal with the Willamette inventory as it changes over time.

All of these harvest schedule scenarios could be utilized under any of the DEIS alternatives. The Department of Forestry urges the Forest Service to seriously consider such

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creative strategies for maintaining a higher level of ASQ, while maintaining other forest qualities.

Current Management Assumptions - (DEIS, II-96) The Willamette has not fully explained the 67 MMBF drop in timber volume due to "current management assumptions". An explanation for this decline that is given by the forest is fewer commercial thinnings and new model assumptions. Due to its serious impact on the availability of wood, we would request that the planning team specifically define how the 67 MMBF was determined

ECONOMIC CONSIDERATIONS

IMPLAN Assumptions - (App., B-98) IMPLAN response coefficients for jobs were not listed in the plan but could be derived. For example, response coefficients averaged approximately 9.5 jobs per million board feet, of which 2.9 are direct jobs. This appears low. An analysis was made using Oregon timber harvest reports and Oregon Covered Employment Data for jobs that would be equivalent to direct jobs in IMPLAN. Each million board feet of timber harvested was found to account for more than 6 direct jobs. This estimate is conservative because it does not include proprietors (which are not included in the Employment Division statistics), it includes eastern Oregon where fewer direct jobs per million board feet harvested would be expected than in Linn, Marion, and Lane counties and does not account for the relatively large proportion of Willamette timber going into the labor intensive plywood and veneer sector.

The DEIS has failed to list the IMPLAN response coefficients for jobs, personal income, value added and local business taxes. This information is essential for public review of the forest plan and must be included in the Final EIS.

IMPLAN Timber Outputs - (App.,B-93) The IMPLAN model was constructed by removing part of the selling value of the stumpage to account for leakage from local economies to the federal government for stumpage. The Department of Forestry disagrees with the Willamette's method of construction of the IMPLAN input/output model for several reasons:

1. The Umpqua and Willamette National Forests are the only two Oregon forests we have reviewed that use this procedure to adjust for federal revenues. This makes employment & income comparisons among national forests

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inaccurate because they use different procedures. For example, the effects of shifting timber harvests from Mt. Hood to the Willamette or Umpqua to provide more recreation opportunities closer to Portland could not be analyzed because the IMPLAN response coefficients are not comparable.

In addition, statewide economic impacts have yet to be documented. Therefore, analysis of economic impacts can only be made among alternatives on individual forests. They cannot be made for national forests, for timbersheds, nor at the state level. These are major flaws in the planning process and should be corrected in the cumulative effects analysis and in the Final EIS.

2. Rather than separating the volume of timber from the Willamette into the sawmill and veneer and plywood sectors, the two sectors were aggregated. This may bias the analysis if the plywood/lumber output per unit input in the area is different than estimated in the model. Fifty-five percent of Willamette stumpage goes into plywood and veneer mills, much higher than the statewide average. Statewide, the plywood and veneer industry creates 6.5 direct jobs per MMBF processed (log scale) while the lumber industry creates only 4.1 direct jobs per million board feet (log scale).

Since the two sectors have large total gross outputs and since data on stumpage flows to mills is available, it would be more appropriate to not aggregate these sectors in the model and to separately analyze the effects of different harvest levels.

3. Final demand values for timber products were calculated. It was not documented if the final demand for residual products were accounted for (e.g., to account for paper industry raw materials derived from Willamette stumpage). Since final demand values for timber were based upon the selling values used for final timber products in the timber sale appraisal process, residuals should also have been taken into account during the appraisal process. Residues are usually figured into the final demand values at the lumber/plywood mill level during appraisal.

In addition, much cull material could have been and probably was processed into products having a final stumpage demand value. How was this accounted for? The Final EIS should provide a better explanation of this analysis.

4. The final demand values were based on appraisal reports; selling value of the stumpage was removed. Since the selling value had considerable overbid, and much of this stumpage was returned with contract relief,

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will be defaulted on, or was processed unprofitably, the reduction could have been considerably overstated, unless an undocumented adjustment was made. This should be explained in the Final EIS.

5. Using the 1977 Douglas County IMPLAN model and "Lister Reports", our analysis indicates that according to report 3.220, Sector 136, logging has total imports of 92 million dollars, compared with total gross outlays of 181 million dollars. In addition, competitive imports by logging from sector 11, which corresponds to BLS Forestry Products, total 32 million dollars. It appears that considerable imports are accounted for in IMPLAN. Was an additional adjustment for stumpage appropriate? It is likely that revenues from most stumpage sales in Oregon, not just national forest sales, would have left local areas of economic influence in 1977. Does the model already account for this? If so, why is a special adjustment for national forest timber necessary?

Along with response coefficients, we believe additional information is needed regarding construction of the IMPLAN models, particularly documentation of the economic impact analysis of payments to counties in lieu of property taxes and of federal expenditures spent by agencies of the Federal Government to manage the Willamette.

The Final EIS must provide additional details regarding construction and use of the IMPLAN models. Insufficient information is presented and that which is noted in the planning documents is vague and poorly explained.

Socioeconomic Analysis - (App., B-93-101) Forest Service timber sales are critically important sources of revenue for local governments and schools as well as for state government. Recent data indicates that about six percent of the timber sold on the Willamette is processed at mills in Southwest Oregon, almost all of it in Douglas County. In light of this data, the primary area of influence for the Willamette should be expanded to include Douglas County.

The socioeconomic analysis presented in the DEIS is also incomplete in that it does not consider many of the benefits of forest management to local communities and the State of Oregon. In addition to tallying the effects of alternatives on county revenues, an analysis should be undertaken to estimate the effects on state income tax collections, timber harvest taxes, public road use fees and taxes and property taxes. It is not possible to thoroughly evaluate the effects of the various alternatives on the well-being of Oregon's citizens until these benefits have been analyzed.

In view of the projected falldown in timber from private

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forest lands, it would appear that competition for Willamette timber will become more fierce. Therefore, timbershed boundaries will become more elastic and areas of economic influence will become more flexible This should have been taken into account by the Willamette and the economic area of influence should have been expanded.

Also missing from the discussion is an analysis of base and residentiary industries. Recent work by the Department of Forestry has determined that lumber and wood products accounts for more than 50% of private basic employment in Lane and Linn Counties and more than 30% in Marion County. This basic employment should be addressed in the Final EIS since it provides a large percentage of the exports which fuel the area's other industries and businesses.

Costs Used For Economic Efficiency Analysis - (App., B-79) The criteria for identifying fixed and variable costs and for including those costs in FORPLAN appear to be based on a desire to simplify the model formulation rather than to seek the most economically justifiable solution. Only selected timber costs are considered as variable costs in FORPLAN. All other costs are treated outside the model and, in effect, are "protected" from the model's optimization decisions. Two examples might assist in explaining this point:

1. Timber planning and genetics programs are fixed. It seems reasonable that as harvests rise and fall, timber planning and genetics program costs would vary.

2. Logging system costs for commercial thinning using ground and skyline systems were empirically derived from a set of 12 thinning sales. This is too small a sample from which to derive logging costs for both systems. Furthermore, 1982 was not a representative year for logging in Oregon due to the economic depression occurring at that time.

3. Nowhere in the documents could the Department find timber management costs used in Willamette's analysis.

The DEIS provides only limited information on the appropriateness of these costs or the resulting benefits as compared to other possible combinations. Given the magnitude of change proposed among the alternatives, a less arbitrary process is needed.

Local Timber Supply and Demand - (DEIS,III-181,) The Willamette planning staff has made a sincere effort to analyze the supply and demand situation existing on the forest. However, our review has identified several issues which we feel should be addressed in the Final EIS:

1. The analysis of projected demand for Willamette timber does not address increased demand expected to come from adjacent timbersheds.

2. Future harvest levels are based on projections developed in Timber for Oregon's Tomorrow. Additional analysis should have been done on the assumptions used in this study. For example, recent research has shown that manageable stands are absent on a large portion of the nonindustrial private ownership in Oregon; stocking of mature stands is only about 40 percent of normal. In addition, rotations will likely be significantly longer than assumed in the Beuter Report.

3. The Forest utilizes 1978-1985 average harvest levels. Elsewhere in the planning documents the Willamette uses 1978-1986 data. Since recent harvest levels are available, they should be part of the data base from which changes are made. Demand for timber has increased drastically in 1985 and 1986. Future timber demand trends should utilize the most current data available. The Oregon Subregional Market Model, once it is available, should give the forest a more accurate reading on demand for Willamette timber and on the market effects of the forest's proposal.

4. It is unsettling to realize that additional watershed and wildlife constraints, above those which are currently being proposed under the preferred alternative, may even further reduce the ASQ after the plan is implemented.

Because of these supply and demand factors, it is essential that the Willamette National Forest maintain or increase its timber sale program during the next decade.

National and Regional Timber Demand and Supply Projections - (DEIS, III-181) All timber availability projections for west- central and southwest Oregon predict large drops in timber harvests on industrial ownerships during the next several decades. The most recent work by Forest Service Economist Kent Connaughton supports these conclusions (Note Attachment 1).

This decreased supply comes at the same time as demand for wood products is predicted to increase. For example, current building remodeling is expected to utilize 15 billion board feet (BBF) of the total 50 BBF of United States lumber consumption. At the same time, the 15 percent surcharge on Canadian lumber imports will reduce this imported supply source. Recent projections by Clear Vision Associates show that the bid price for westside Douglas-fir Forest Service stumpage is expected to jump from $187 per thousand board feet (MBF) in 1987 to $224 per MBF in 1988.

Japanese housing starts will total 1.71 billion in 1987, more than is expected this year in the United States. Because of

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the lowering of the value of the dollar relative to the yen, American lumber and logs will be more attractive in the Japanese market. The import share of softwood timber arrivals at Japanese sawmills will increase from the 1985 level of 52 percent to 60 percent in 1988. Douglas-fir log exports to Japan from Oregon and Washington in 1988 are expected to be 19 percent higher than in 1987. Total overseas exports from the two states will be more than 3 BBF next year.

These trends indicate that competition for a scarce resource, Oregon's timber stumpage, could increase dramatically in the coming years, benefiting those owning standing timber. Those companies without adequate fee timber could be severely damaged, unless adequate supplies of timber are available from the public ownerships in west-central and southwest Oregon.

With this intense competition for west-central and southwest Oregon stumpage, it is unrealistic for the Willamette to conclude that a horizontal demand curve exists for the forest's timber. A demand function could be calculated for use in FORPLAN. If this is not possible at a forest level, it is possible at a timbershed level. The southwest Oregon Subregional Market Model will soon be available to make reasonable estimates of stumpage demands for various ownerships. Region 6 is already using this model in their projected analysis of the cumulative effects of the forest plans. A similar analysis should be incorporated in the Final EIS for the Willamette National Forest and provided to the public for review.

The alternative to recognizing the possibilities for increasing demand for public stumpage is a return to the destructive speculative bidding of the late 1970s. Such an action combined with restrictive monetary and fiscal policies on a national level could force Oregon's economy into another recession.

The Final Plan should also provide the analysis required by former Chief Peterson in his January 12, 1987 memorandum to the Regional Forester. The memorandum, entitled "Planning the Management Of the Timber Resource on National Forest Lands", provides specific guidelines for improving the discussion of timber supply/demand relationships by acknowledging recent events, changed conditions, and new information. Increased remodeling demand, lower interest rates, Canadian stumpage pricing, and the Staggers Act are all examples of such changes. As Chief Peterson stated, "...the rationale (behind the forest's conclusions) must be clearly articulated in the appropriate planning documents and our assumptions regarding potential future demand be reasonable and supportable".

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Below Cost Timber Sales - (DEIS, III-192) The Willamette has provided a brief discussion on the status of below cost timber sales. The only conclusion, however, that can be reached from the presentation in the DEIS is that old growth timber sales on the Willamette cover their costs. Additional analysis by the forest is needed on the following:

1. The percentages of sales and volume that are below cost;

2. the amount of cross-subsidization that occurs;

3. a historical perspective; and

4. the treatment of this issue by the alternatives.

Forest's Budget - (DEIS II-134) The forest has not presented historical budget levels in the planning documents. Without this information, it is difficult to compare proposed budget levels by alternatives to past levels to see if they would be increased substantially. It is stated in the DEIS that all of the alternatives, except B-dep, J-dep and A, require budgets lower than the current forest budget. While the Department realizes that decreased timber harvests will lower forest management costs, increased costs will be inccurred in such programs as recreation, fish and wildlife management plus other resources values. Will the forest's total budget in reality, actually decrease from past levels?

If funding is not approved, the Willamette's activities and outputs would have to be modified. The Department encourages the Willamette to consider budget constraints in the FORPLAN model in order to provide more efficient solutions that can then be explored through analysis. Without these constraints in the analysis, forests have a tendency to cut programs rather than to manage the forest differently when faced with a reduced budget.

A series of FORPLAN analyses utilizing multiple levels of budget constraints could provide information on such management options. These analyses will allow the forest plan to be implementable under a wider range of future conditions. Disclosure of such detailed analyses will help the Willamette satisfy NEPA requirements.

O&C Lands - (DEIS, III-229) The Willamette manages 51,000 acres of Oregon and California Railroad (O&C) lands. These lands are particularly important to local governments since 50 percent of the revenue generated by these areas is transferred to the counties for use in funding needed services such as road projects and schools and in reducing property taxes. Other Forest Service lands contribute only 25 percent of their revenue. During the years 1979-1985, O&C

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lands contributed five percent of the Willamette's payments to counties while comprising only three percent of the total landbase of the forest.

The Final EIS should provide information on the location of these O&C lands on the Willamette, how they are allocated among alternatives and their contribution to payments to counties. Opportunities should be explored to maximize the number of O&C acres retained in the suitable land base.

NEEDED CLARIFICATION OF PLANNING DIRECTION

Old Growth Habitat - (DEIS, II-111, III-51) According to the DEIS, some 868,000 acres of mature and old growth trees currently exist on the forest; 639,000 acres of which would be considered old growth by the definition stated in the plan (DEIS, III-53). Of the total mature and old growth stands, 410,000 acres, at a minimum, will be retained as Wilderness, unsuitable lands and MMR set-asides. An additional 44,500 acres (DEIS, IV-55) of mature and old growth stands, under the preferred alternative, will be unavailable for harvest due to their placement into other constraining management strategies, i.e. Special Interest Areas, Old Growth Timber Groves, riparian areas, semiprimitive nonmotorized sites, special wildlife areas, Research Natural Areas and visual management areas.

Alternative J provides the fourth highest amount of old growth, 508,759 acres, which is 24 percent above fifth decade minimum levels. Due the State's dependence on maintenance of the timber harvest levels on the national forests, it would seem that the Willamette is not considering the importance of a stable supply of raw materials to local mills. The plan retains a sizable amount of mature and old growth trees for the next fifty years.

The Willamette National Forest should expand its discussion on old growth timber in the Final EIS to include more detail on why the forest needs to retain additional old growth areas above the minimum levels.

Riparian Areas - (DEIS, III-48, App H-20) It is noted in the DEIS that riparian widths of 400 feet on class 1 and 200 feet on classes 2 and 3 streams have been identified for protection. Using these widths, causes some 46,842 acres of suitable forest land to have the harvest reduced by 6-38 percent in order to meet the constraint.

NFMA regulations require that special attention be given to

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land and vegetation for 100 feet from riparian areas. While the Department strongly supports adequate protection of riparian areas we question the seemingly excessive width that is applied to these areas on the forest. The Final EIS should explain why the forest has chosen to exceed the Regional Guide direction on protection of riparian area vegetation and should clearly show the benefits, costs and tradeoffs of the width chosen including information on costs and benefits of other less constraining riparian widths.

Timber Inventory - (App., B-24, B-46) The discussion of resource tradeoffs among the Willamette's proposed alternatives should include information on the long-term effects of these alternatives on the timber resource. Data on the relationship between timber inventory, harvests and growth, as well as the changes over the planning horizon in the number of working group acres by age class for each alternative should be provided in the Final EIS. These reports are readily available from the FORPLAN model (Reports 10.6 and 10.8) and should be constructed to provide this information for suitable, tentatively suitable, and total forested lands.

Additional comments regarding the Willamette's timber inventory include:

1. Analysis area stratification was by five size classes rather than age class and site class. This may have lead to considerable underestimation of timber productivity potential on the forest.

2. The Willamette should consider using SPS to model yields for true fir and mountain hemlock types and for stands greater than 100 years of age. PROGNOSIS was used for these types, however, considerable manipulation is necessary to project the yields from true fir and mountain hemlock. PROGNOSIS is also not calibrated for the Oregon Cascades. SPS should be evaluated to see if it could better model yields of true fir and mountain hemlock.

3. Growth of managed stands was reduced beyond 100 years of age until, by age 140, they equalled the volume of existing 140 year old stands. Major problems with this procedure are that the empirical yield tables are not sensitive to stocking level changes and that yields will be severely underestimated. Modeling efforts with SW ORGANON and research by Franklin plus others leads us to believe that stocking levels in older stands can be manipulated to increase growth and that high growth rates in older stands is possible. With proper management, attainment of stand characteristics for which stands greater than 100 years are grown, can be assured while producing large volumes of timber.

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4. SPS will allow modeling of less than 300 stems per acre and stands with more than one tree species This would be useful in preparing prescriptions for riparian areas and other sites for which DFSIM is inappropriate.

5. It appears that reductions were taken for just about everything including unstocked holes in plantations. This is to account for localized, unstocked areas due to unsuited soils, soil compaction, disease, etc. However, reductions have already been made for unsuitable areas (which were not ground verified). There may be stockable as well as unstockable areas both inside and outside the base. It would therefore appear that a double reduction was taken. Further analysis, including field verification, should be conducted by the forest to better determine their unsuitable lands.

6. The plan states that 1973-1976 inventory is the most recent timber resource inventory. This is not accurate as the 1984-1986 PNW forest survey is currently available from the Experiment Station in Portland.

7. Timber was apparently classified by timber type but not by productivity classes. According to Timber Supply Assessment inventory files, approximately 18 percent of timberland on the Willamette is site class 2 or better with some 21 percent site class 5 or worse. Timber site productivity should have been an important factor in tradeoff analysis as well as for building yield tables.

We trust that the Willamette planning team will address these concerns in the Final EIS.

Data Base Development - (App., B-4) A grid mapping system, the Mt. Hood National Forest's version of R2Map, was used for geographic planning information. A one inch to the mile scale was used. While this is appropriate for general planning purposes, we would like to make sure that it was used appropriately for classification of land suitable for timber management. Was on-the-ground verification of unsuitable areas done, rather than using the stratification just pulled off the grid maps and entered into FORPLAN? As was noted earlier, additional analysis must be considered to determine the Willamette's unsuitable lands.

Recreation Use - (DEIS, III-96) If demand for dispersed recreation is expected to increase during the life of the plan, the Department of Forestry questions the forest's meager trail construction program consisting of only 2 miles of new trail annually. Some 154,000 acres are being proposed for unroaded status (67,000 acres remaining unroaded and 87,000 acres assigned to roaded but with no planned harvest for 15 years). The Department recommends that the forest

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reconsider its trail construction program by placing trails in areas which will have a minimal impact on both short and long term timber harvest levels. Some consideration should be given to replacing trails in high impact areas with trails in unsuitable unroaded areas.

We support the implementation of recreation plans that reduce the conflicts between recreation and timber production and that result in few negative impacts on the planned ASQ.

Geotechnical Methodology - (DEIS IV-3, App. B-61) A Department of Forestry geotechnical specialist has reviewed the Willamette National Forest plan to evaluate how mass soil erosion, surface erosion, and cumulative effects of soil movement were described and modeled. The "best management practices" to be used in road construction and timber harvesting were also reviewed (See Attachment 2).

From this review the following conclusions were reached:

1. The calculated erosion rates probably under-estimates actual background rates and erosion off less steep slopes while over-estimating the difference between the natural and the management induced rates.

2. Best management practices for silvicultural operations are discussed in detail while BMP's for the transportation network are discussed only in the most general terms.

Please consider the Department's detailed comments regarding geotechnical methodology found in attachment 2.

Road Management - (DEIS III-169, IV-165) The Willamette planning staff has failed to recognize the importance of a comprehensive road management program. Several discussions in the planning documents indirectly address this issue. The Department of Forestry supports a transportation policy which recognizes the importance of closing unneeded roads either seasonally or permanently. Cooperative road closure programs in other national forests in Oregon during hunting season have proven very successful. Benefits of such regulated road closures include:

1. An increase in the amount of effective wildlife habitat.

2. Improved animal hiding cover effectiveness.

3. More opportunities for high quality, semi-primitive hunting experiences.

4. Reduced conflict between timber and wildlife management.

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5. Reduced road maintenance costs by reducing hunter traffic during wet fall months.

6. Reduced potential for adverse effects on water quality from forest road use.

The Department of Forestry encourages the Willamette to review other national forest programs on road closures, including discussions with Oregon Department of Fish and Wildlife, and thereby develop a more comprehensive road management program that is required to meet the needs of the public for both timber and wildlife.

The "No Change" Alternative - (DEIS, II-37) The addition of the "No Change" alternative by the Forest Service is an attempt to address the concerns raised by the Northwest Forest Resource Council in its appeal of the formulation of the "Current Direction" alternative. These concerns, many of which are also voiced by this Department, involved the legal adequacy of a "no-action" alternative that included new yield tables, a new land suitability analysis and the addition of MMR constraints.

The Department appreciates the efforts that the Willamette planning staff has made to provide a meaningful alternative which more adequately satisfies the requirements of NEPA and NFMA. The "No Change" alternative appears to be a compromise approach that presents a more accurate, unaltered historical reference for public review.

Research Needs - (LRMP, II-9) The Forestry Program for Oregon encourages research to improve forest productivity, the economics of intensive forest management, and to identify the habitat needs of old growth preferring wildlife. The Department of Forestry supports the research program outlined by the Willamette. In addition, we believe more research is needed to:

1. Develop new technology to return some of the 131,56 acres removed from the suitable land base because of regeneration difficulty back to timber management status.

2. Improve the knowledge of the wildlife species preferring old growth.

3. Improve the forest's capability to estimate supply and demand relationships for Willamette timber.

4. Further refine and improve the forest's timber yield tables.

5. Improve the knowledge of big game habitat needs.

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Monitoring and Evaluation - (LRMP, V) The Willamette's proposal for monitoring and evaluating the forest plan, once it is implemented, will be one of the most important sections of the planning documents. Chapter V in the LRMP, presents a fairly comprehensive monitoring and evaluation program for the forest. Several concerns, however, have surfaced from our review of this section.

1. When monitoring management indicator species (LRMP page V-II), what would happen if one or more of the species to be monitored increased, instead of decreased, in terms of the number of sites being occupied? The variability standards presented in the monitoring plan only measure declines in occupied sites. Would less stringent MMR levels be considered if an increase in occupied sites occurred?

2. While the monitoring plan measures changes in job numbers and returns to counties, a variability standard of 20 percent with a two year monitoring period are excessive. The economic and social disruptions resulting from a 20 percent reduction in job numbers and returns to counties would be unacceptable. This could be avoided if a narrower variability standard of 10 percent was used. This same standard should be used for all activities which affect community stability.

3. The Department recommends that personal income also be evaluated under section 10 of the monitoring plan.

4. Finally, it is unacceptable that the decision to amend or revise the plan be based solely on a subjective judgement by the forest supervisor. For each monitored activity, specific actions should be identified which will take place if the threshold of concern is exceeded. For example, if the appropriated budget for the forest prevents the Willamette from providing at least 90 percent of the allowable sale quantity (ASQ) proposed by the plan, the monitoring program should describe the plan amendment or revision process that will be implemented.

Overall, we commend the forest on developing a monitoring and evaluation program which will continually measure the output levels and make changes to the plan when necessary. Funding for this important program should be given a high priority by the forest.

ATTACHMENT 1

Source: Preliminary draft by
Kent Connaughton for
the Forestry Program for
Oregon technical assessment
1988

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SUMMARY

1. None of the DEIS alternatives fully meet the objectives of the Forestry Program for Oregon. However, we find that Alternative B-dep performs the best in this comparison. The potential exists for the Willamette to craft an alternative, not presented in the DEIS, that fully satisfies the FPFO objectives and provides a balance of resource uses, benefits and values.

2. The forest plan should demonstrate closer coordination with Department of Forestry programs, particularly in the areas of fire management and riparian area protection.

3. Planning assumptions and decisions on the subjects of unsuitable lands, unroaded areas, riparian areas protection, minimum management requirements, snag management, visual management, harvest cutting methods, and harvest scheduling all have a direct effect on timber output levels. These assumptions and decisions require additional discussion and potential revision in the Final EIS.

4. Shortcomings in the Willamette's economic analysis have likely distorted the costs and benefits associated with the DEIS alternatives. In particular, the assumptions on timber supply and demand may be underestimating the importance of the outputs from the Willamette National Forest to Oregon's economy.

5. Additional information should be provided in the Final EIS in the areas of old growth habitat, timber management tradeoffs, timber inventory, existing forest plan output levels, research needs, and the Willamette's monitoring and evaluation program.

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GEOTECHNICAL REVIEW OF THE
WILLAMETTE NATIONAL FOREST
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Keith Mills, Geotechnical Specialist, PE
Oregon State Department of Forestry
Forest Practices Program

February 12, 1988

The purpose of this review is to evaluate the geotechnical methodology found in, and used in development of the Willamette National Forest Proposed Land and Resource Plan, and Draft E.I.S. This methodology includes: the descriptions and models of mass and surface erosion, the Best Management Practices for the transportation network, and silvicultural harvesting operations, and the description of cumulative effects. This review covers the plan, appendices, and other relevant literature and data available to the forest which deal with geotechnical problems.

The erosion rates for the various alternatives were based mainly on empirical data from the H. J. Andrews experimental forest. Little data from the rest of the Willamette National Forest was available for calculation of relative erosion rates, either for suface erosion, or mass movement (landsliding). Cumulative effects were based on watershed "sensitivity" and hydrologic "recovery", and in general were treated by dipersion of disturbing practices.

Surface erosion rates are based on 9 studies, 8 of which were conducted in the Andrews Forest. The hazard is based on slope only, with three classes: 0 to 30 percent, 30 to 60 percent, and over 60 percent. Erosion rates were assumed to be at the high level for ten years after timber harvest. Most other models of surface erosion have concentrated on soil physical properties. Although slope is very important for calculating erosion rates from dry ravel, gullying and other water related surface erosion are more dependent on soil texture, and whether or not the soil is compacted. The surface erosion rates used by the forest apparently do not reflect gully type erosion, which can have the most severe impacts on soil and water resources. It is unlikely that erosion rates will remain at the same elevated level for ten years after harvest, as revegatation will substantially reduce erosion rates usually within 2 or 3 years after harvest.

An apparent error was noted in figure B-C-10, where the background erosion rate was shown to be 4.7 x 10 yd^3/acre/yr. This is very high, and the 10 should have some negative exponent, which was probably left off.

Lands are put into three cateogories for mass erosion hazard: stable, moderately stable, and potentially unstable. These classes are based on slope and hardness of bedrock. Background mass erosion rates in forested, harvested, and roaded land were based on a small air photo inventory with very limited on-the-ground surveying. Such an inventory has the following problems:

- o An air photo inventory is biased against landslides hidden under forest cover, and
- o road failure erosion rates are based on older practices, and probably over-estimated failure erosion rates with current Best Managment Practices.

There are many large earthflow type or complex landslides in the Western Oregon Cascades. Most of these large slides are natural, they are generally found on slopes under 40 percent, and the movement rates of such large slides are not greatly affected by management practices. Nowhere are such landslides considered in the EIS, neither in the calculation of background erosion rates, or discussion of BMP's for large slide areas. The mass erosion rates are calculated mainly for debris slide type mass movements.

Cumulative effects are nowhere defined, though there is still a section describing possible effects and mitigation stratigies. Basins are assigned ratings of unlikely, possible, or probable for cumulative effects. The section which describes cumulative effects, pages IV 29-36, is confusing, with little apparent direction. Dispersion of activities is recommended as the principal practice to reduce cumulative effects. Dispersion does make sense, at least in the planning stage. Cumulative effects should also be tied to the monitoring program, and should consider such activities as road or management site construction, and also have provisions for unexpected problems, such as large landslides, which could lead to cumulative effect problems.

Silvicultural best management practices are described in detail, especially those practices which tend to reduce accelerated rates of surface erosion. These include: burning intensity, limitations on ground disturbance and compaction, revegetation standards, and reforestation techniques. These practices as described meet or exceed all accepted BMP's for prevention of surface erosion. The transportation network (roads), however, is much more likely to affect erosion rates than are silvicultural practices, especially the rate of mass erosion (landslides). Road design, construction, and maintenance practices are only described in the most general terms. Actual road related BMP's as actually implemented on the forest are of very high standard, but these practices are not described in sufficient detail in the plan.

The interdisciplinary term which prepared the Willamette National Forest Plan did not include a geotechnical specialist (geotechnical engineer or engineering geologist). The forest has an excellent geotechnical staff, probably the best of any forest in the country. Why none of them were included on the team is not clear. The descriptions of BMP's related to the transportation network, now incomplete, could have easily been prepared by a geotechnical specialist. The description of mass erosion, and determination of mass erosion effects, would also have been enhanced by a geotechnical professional.

The specific practices for review of road P-lines, utilization of slope stabilization structures, and control methods for actively moving landslides should be included to some degree in the plan.

The lands unsuitable for timber production, especially the unstable lands considered unsuitable, are not described in the plan itself. The 42,000 "unstable" acres removed from the timber base are described in the "Timberlands Suitability Study", conducted by the forest soils scientist. I did not review this study.

Conclusions:

1. The calculated erosion rates probably under-estimate actual background rates, and erosion off less steep slopes, and over-estimate the difference between the natural and the management induced rates. This is because:

   - o The surface erosion data does not consider soil physical properties, only slope, which measures mainly dry ravel and not rilling or gullying;
   - o The mass erosion data is based mainly on debris slides, and not earthflows or complex slides common in Oregon Cascades.
   - o The aerial photo data to establish background rates of mass movement probably did not detect all landslides covered by a canopy of trees.
   - o The rate of landslides from roads may be high, as those failures were generally on roads constructed under old practices (sidecast, etc.) which have now been improved.

2. Best management practices for silvicultural operations are discussed in detail, while BMP's for the transportation network are only discussed in the most general terms.

3. No geotechnical specialists were included on the interdisciplinary team. Description of possible mass movement problems, and BMP's for mitigation and control of these problems, would have been more reliable had there been more geotechnical input during the planning process.

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STATE OF OREGON INTEROFFICE MEMO

TO: Norm Johnson, Federal Plans Coordinator

DATE: March 16, 1988

FROM: Bill Young, Director
Water Resources Department

SUBJECT: Comments on the Willamette National Forest Draft Environmental Impact Statement and Land and Resource Management Plan

In response to the Governor's Executive Order on federal forest plans, the Water Resources Department offers the attached comments.

In general, the Willamette National Forest has done an outstanding job of presenting water resources data and issues. The Forest provided readers with a thorough analysis of the effects of forest management practices on watersheds; arrayed specific information on current watershed and stream conditions; identified watershed sensitivities; analyzed cumulative effects; recognized the importance of forest watershed management to downstream water users; and afforded rigorous protection to riparian areas.

The attached comments suggest additions that should complement the Forest's commendable effort. Generally, the comments focus on the following points:

1) Use of Water Resources Commission basin programs for determining state priorities for protection of streams and watersheds.

2) The need to make achievement of hydrologic stability a Forest goal for all watersheds.

3) The level of water resources protection afforded by the Forest Service preferred alternative.

We appreciate having this opportunity to comment. If you have any questions regarding our comments, please contact Rick Bastasch at 378-3671.

Attachments:
1. Comments
2. Minimum Streamflow Drainage Map
3. Mid-Willamette Basin Program
4. Upper Willamette Basin Program

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COMMENTS ON WILLAMETTE N.F. DEIS & LRMP

The Water Resources Department has organized its comments into three sections:

I. Comparison of DEIS & LRMP with Agency Policies and Programs
II. Suggestions for Improving the DEIS
III. Assessment of Forest Service Preferred Alternative
IV. Attachments

I. Comparison of DEIS & LRMP with Agency Policies and Programs

The Water Resources Commission is charged by Oregon law with formulating integrated, coordinated programs for the use and control of water resources of the state. These programs are tied to river basins and designed to encourage the beneficial use and control of water resources, as well as the development of additional water supplies.

The Willamette National Forest is drained by two major river basins the state has defined for water management: the Mid and Upper Willamette Basins. The Mid Willamette basin includes the Santiam drainage. The Upper Willamette basin includes the McKenzie and Middle Fork Willamette drainages. The Commission has adopted programs for both basins. These programs are an assessment of the importance of various waters to the state. As such, they should be consulted in the formulation of any plan that might affect water resources — including the Willamette National Forest DEIS and LRMP.

A. The Mid Willamette Basin Program

In summary, the state, through the Mid Willamette program, places a high value on instream uses in the Santiam drainage. The program acknowledges the importance of irrigation, but emphasizes the outstanding values associated with the drainage's recreation potential, anadromous fishery, and low water temperatures. In recognition of these values, the state protected selected streams through restrictive classifications and minimum perennial streamflows.

The Commission restricted the following streams (and all their tributaries) and all natural lakes in the Mid Willamette basin above 2,000 feet for primarily recreational purposes (instream and low-consumption uses):

- Little North Santiam River and Henline Cr. above their confluence.
- Wiley and Little Wiley Cr. above their confluence.
- Breitenbush River.
- Calapooia R. above Bigs Cr.
- North Santiam R. above Tunnels Cr.
- Middle Santiam R. above Green Peter Reservoir.
- Quartzville Cr. above Panther Cr.
- South Santiam R. above Trout Cr.

In 1987, the state also designated the Little North Fork of the Santiam, from Battle Ax Creek to the Forest boundary, as a scenic waterway.

In addition, the Commission has established minimum perennial streamflows in proximity to the National Forest to protect instream uses in the following streams:

- Calapooia R. above gage 14172000 at Holley.
- South Santiam R. above gage 14185000 below Cascadia.
- Middle Santiam R. above gage 14186500 near Foster.
- Wiley Cr. above the mouth.
- North Santiam R. above gage 14178000 near Detroit.
- North Santiam R. above gage 14181500 at Niagara.
- Little North Santiam R. above gage 14182500 near Mehama.

B. The Upper Willamette Basin Program

The state, through the Upper Willamette Basin program, acknowledges the importance and need for irrigation. Major emphasis in the program, however, is given to recreational, municipal, and fisheries uses. In the Middle Fork Willamette drainage, for example, the Commission found that many streams have insufficient flow for nonconsumptive uses during summer months. Recreation was found to be an important, and growing, use. Maintaining minimum perennial streamflows was given a high priority.

In the McKenzie River drainage, the Commission also recognized water shortages for instream uses and the importance of water-based recreation. The McKenzie River was termed a superior natural recreation attraction. The benefits of municipal water use were found to be significant. The importance of the drainage's fishery resources, both resident and anadromous, was noted. Finally, the Commission found that the most important use of the Upper McKenzie was for recreation and fish and wildlife purposes.

In recognition of these findings, the state has protected selected streams through restrictive classifications, scenic waterway designations, and minimum perennial streamflows. Waters that are restricted to recreation, instream uses, and low-consumption uses include:

- The McKenzie River from Clear Lake to rivermile 84.5.
- The waters of Salt and Salmon Creeks and their tributaries.
- All natural lakes in the Middle Fork Willamette and McKenzie River drainages.

The state has also designated Waldo Lake and the North Fork of the Middle Fork Willamette above Westfir as a state scenic waterway.

In addition, the following minimum perennial streamflows have been established on streams in proximity to the National Forest to protect instream uses:

- South Fork McKenzie River at mouth.
- Blue River at mouth.
- McKenzie River at USGS gage 14162500.
- Gate Creek at mouth.
- Middle Fork Willamette R. above N. Fork.
- North Fork of the Middle Fork Willamette at mouth.
- Little Fall Cr. at mouth.
- Fall Creek at mouth.

C. Significance of State Water Use Programs

The programs cited above were originally formulated nearly 25 years ago. However, they are largely topical, having been amended from time to time in recent years. The Water Resources Department will begin a major new study of the entire Willamette basin this spring. The resulting programs, although substantially different in format, will probably still emphasize instream values for the drainages of most concern to the Forest. New programs, such as that for the John Day River Basin, place a greater emphasis on riparian protection, watershed enhancement, and water management than older programs.

The values recognized and protections afforded in the Mid and Upper Willamette programs, along with the direction established by the John Day program, form the basis for this agency's review of the Willamette National Forest DEIS and LRMP.

Because water use programs are the means by which the state assesses its water resources, they should be consulted during forest planning. These should be cited on DEIS p. IV-36 under "Relationships with Other Agency Plans or Policies for Water."

The DEIS should indicate that nearly all Forest Service lands contribute to minimum streamflow points in proximity to the Forest. (See map in attached materials.) In addition, those streams identified by the state for special protection should be referenced. In short, the streams and drainages protected under basin water use programs should serve as a red flag for forest planners and the public. Land allocations and proposed forest actions in these areas warrant increased scrutiny.

II. Suggestions for Improving DEIS

A. Hydrologic Recovery and Dispersion Constraints

The hydrologic recovery concept forms the basis for much of the Forest's watershed analysis. Unfortunately, the concept is elusive, for it represents a shifting areal proportion based on watershed sensitivity. In addition, the concept implies, but does not require, harvest dispersion constraints.

For example, the explanation of hydrologic recovery on DEIS p. IV-26 needs to be simplified. The relationship between the "transient snow zone", "harvest units", and "subdrainages" is unclear, especially since the discussions that follow apply the concept to watersheds.

Perhaps the replacement of "recovery" with "stability" would be less confusing. The following two paragraphs are offered only as examples of how the discussion might be simplified:

"Watersheds in natural condition have characteristic run-off patterns. Generally, they absorb more water, and release it more slowly than disturbed watersheds. Disturbances can be either natural, such as forest fires, or human-caused, such as roads and clear-cuts. Research on the Willamette National Forest has shown that, depending on watershed sensitivity, when 20 percent or more of a watershed is in a disturbed condition, the natural hydrologic balance is upset: peak streamflows increase both in volume and frequency. This damages stream channels, riparian areas, and forest facilities such as bridges and roads.

The Forest has developed a system to assess hydrologic stability based on watershed sensitivity and the percentage of watershed disturbance. On the Willamette, an area is considered disturbed if it has been logged in the last 25 years or if the trees are smaller than eight inches in diameter. A highly sensitive watershed is hydrologically stable if only 20 percent or less is disturbed; a medium sensitivity watershed is stable if 25 percent or less is disturbed; a low sensitivity watershed will remain stable if 30 percent or less of its area is disturbed."

If this interpretation is correct, then it appears that the dispersion constraints necessary to achieve or maintain hydrologic stability are 20, 25, and 30 percent for high, medium, and low sensitivity watersheds, respectively. However, these dispersion constraints are never enunciated. A listing of the watershed dispersion constraints the Forest will operate under should be provided.

Moreover, it is not clear whether the Forest intends to achieve or maintain hydrologic stability in its watersheds. Figure IV-2-8, DEIS p. IV-28, suggests it does not —anywhere from five to 13 watersheds drop below threshold stability levels, depending on the alternative. This figure seems at odds with: 1) the statement on DEIS p. IV-16, "None of the Alternatives exceed 20 percent harvest per decade in drainages larger than 40 square miles..."; and, 2) the statement on DEIS p. III-17 indicating the "Forest established a management consideration that watersheds should be maintained at approximately 75 percent hydrologic maturity..." Figure IV-2-12, DEIS p. IV-34, shows that some watersheds in the forest drop below this level in each alternative.

Maintaining the hydrologic stability levels of forest watersheds should be a goal of forest management under all alternatives. As such, it should be included under the goals section on DEIS p. II-34. Rephrasing the second water resources goal as found on LRMP p. IV-2 presents another opportunity for incorporating hydrologic stability into forest planning: Decrease peak

flows and increase low flows by achieving the hydrologic stability level of forest watersheds.

If the Forest objects to maintaining hydrologic stability levels, perhaps it could design an alternative around hydrologic stability. This would allow an analysis of the costs associated with managing watersheds for less than their hydrologic potential.

B. Watershed Analysis and Cumulative Effects

The Forest developed an impressive approach to assessing hydrologic cumulative effects of forest activities. Watershed sensitivity and hydrologic stability offer sound measures for evaluating the levels of protection that should be assigned. Unfortunately, the Forest does not seem to link this approach with its activity planning. In short, the Forest does not operate under the constraints it has taken so much time to develop. . .

This is illustrated by the existence of watersheds that will probably experience declines as a result of cumulative effects. Watersheds assigned "probable" cumulative effects ratings will experience management-induced declines in beneficial uses levels should they experience a 10 to 20 year rain-on-snow event (DEIS, p. IV-31). Because the forest planning cycle is 10 to 15 years, it is very likely declines will take place for each watershed rated "probable". According to Figure IV-2-10 (DEIS, p. IV-32), this means anywhere from four (Alternative C) to 14 (Alternative B-Dep) watersheds will experience some level of deterioration. The four affected watersheds under Alternative C account for 121 square miles; the 14 under B-Dep account for about 1200 square miles; the 11 under the preferred alternative (J) account for around 850 square miles. That one-third of the Forest's watershed area is vulnerable to management-induced declines under the preferred alternative seems inappropriate.

The Quartzville Creek, Wiley Creek, Quartz Creek, and Winberry Creek watersheds are targeted for decline under all alternatives. The North Fork Middle Fork Willamette River will probably decline under all except Alternative C. These watersheds all contribute significantly to minimum perennial streamflows. All but Winberry Creek are listed as municipal sources on DEIS p. III-24. [Winberry Creek is noted, however, as supporting an important population of wild winter steelhead (DEIS, p. III-28).] In addition, the North Fork is a state scenic waterway. Given the importance of these waters to the state, and the sensitivities of the watersheds, not providing for their protection under any alternative seems unwise. The Forest should plan to protect or improve important watersheds, not schedule their deterioration.

Another perspective on the need for forest watershed protection is offered by an analysis of the minimum perennial streamflow watersheds listed previously in the Mid and Upper Willamette Basin Program sections. The table below displays characteristics of these watersheds:

Minimum Flow Point	Est. % of Subb in Forest	Municipal Use (DEIS, p.III-24)	Associated with High Sensitivity Watershed (DEIS, p. III-31)	Probable Cumulative Effects in Preferred Alternative (DEIS, p. IV-32)	High Level of Habitat Investment (LRMP, p. IV-3)	State Scenic Waterway
Little N. Santiam at mouth	50	X				X
N. Santiam abv gage 14181500	90	X	X	X		
N. Santiam abv gage 14178000	100	X				
M. Santiam abv gage 14166500	40		X	X		
S. Santiam abv gage 14165000	75	X				
Wiley Cr. at mouth	10	X	X	X		
Gate Cr. at mouth	35		X	X		
Blue R. at mouth	95					
S. Fk. McKenzie at mouth	100					
McKenzie R. at gage 14162500	95	X			X	
Little Fall Cr. at mouth	20		X	X		
Fall Cr. at mouth	60		X	X	X	
N. Fk. M. Fk. Willamette	100	X	X	X		X
M. Fk. Willamette above N. Fk.	100	X	X	X		
Calapooya R. abv gage 14172000	10					

The table suggests a range of management caution. Those watersheds with the greatest area under Forest Service management and with the most elements checked warrant a high level of protection. It is apparent that at least the following qualify for such protection: N. Santiam above gage 14181500, Fall Creek at the mouth, N. Fk. of M. Fk. Willamette at mouth, and M. Fk. Willamette above N. Fk. This list is not exclusive — other watersheds may also require elevated protection levels. Some of these are discussed elsewhere in these comments.

In summary, cumulative effects are more than merely theoretical scenarios. They have real costs to forest resources and water users including siltation of Corps of Engineers flood control projects, loss of anadromous and resident
fish habitat and water flows, and increased
water treatment by municipal users. The hydrologic stability constraints developed by the Forest need to be recognized, perhaps as baseline protections onto which alternatives could be constructed.

C. Roads

The Forest has documented the effects of roads on water quite well. With over 6,360 miles of road (DEIS, p. II-101), the Willamette National Forest's road density is about 2.4 miles per square mile. About 39 percent of Class I
through III streams are in or adjacent to harvest units or roads (DEIS, p. IV-17). Roads contribute to peak flows by increasing the miles of effective channel in watersheds (DEIS, p. IV- 25). Nearly 80 percent of the landslides that occurred during the 1964 flood were associated with logged areas or roads (DEIS, p. III-15). Landslides from roads have serious consequences on water quality and fish habitat (DEIS, p. III-16). Over 70 percent of landslides enter streams (DEIS, p. III-16).

On p. IV-23, the DEIS states that mass wasting will not decline because of the acreage harvested and the miles of road built from 1966 to 1986. Although "99 percent" of the proposed arterial and collector road network has been completed (DEIS, p. II-101), the road system will continue to expand during the planning period (DEIS, p. IV-165). This expansion is largely attributable to the construction of local roads. It is apparent that roads will continue to affect water resources significantly.

In view of these impacts, the Forest should be more explicit about mitigation. For example, a discussion of a road closure program might be helpful. Road closure might include obliteration or partial seeding. Although road closure might not always be advisable (due to road materials, future forest management needs, and need for hydrologic maintenance [culverts, for instance]), there may be opportunities to reduce impacts from past mistakes.

Similarly, the mitigation by road design described on DEIS p. IV-37 should be included as standards and guidelines, LRMP p. IV-57.

D. Riparian Areas

Riparian areas appear to be afforded a high level of protection by the Forest. Timber harvest in Class I and II riparian areas is restricted from 0 to five percent per decade (200 year rotation), depending on alternative. Rates in Class III riparian areas are held to seven percent (143 year rotation). Unstable Class IV riparian areas are also protected (LRMP, p. IV-63). The amount of riparian area set aside for special treatment is constant (63,360 acres) from alternative to alternative.

It would be worthwhile in the DEIS to summarize the riparian area standards found in the LRMP. For example, the DEIS references a 90 percent figure for riparian area large-woody debris potential (DEIS, p. IV-19). It is not apparent that this derives from a more important protection — namely, constraints that mandate 90 percent of riparian areas associated with Class I through III streams be maintained in a recovered condition at all times (LRMP, p. IV-62). Similarly, the restricted harvest areas within riparian areas (LRMP, pp. IV-62,63) deserve a higher profile in the DEIS, p. IV-19.

Class IV streams account for nearly 85 percent of the total channel length in the Willamette National Forest. Protection is given only to those reaches that currently exhibit unstable conditions (LRMP, p. IV-63). Although intermittent streams do not support the beneficial uses of Classes I through III, cumulatively they may provide benefits through flood-flow storage and erosion protection. The Forest should consider some level of protection for these streams, as well.

Apparently riparian areas account for less than four percent of the Forest's land area. Figure IV-D-22, LRMP p. IV-36, suggests that timber in riparian areas, if logged, would provide on the order of 6 percent of the annual ASQ. These figures invite the question, what is foregone and what is gained by not harvesting at all in riparian areas? Developing an alternative to answer this question would be a valuable supplement to the DEIS.

Lastly, the Forest might consider elevating its riparian special treatment areas to management areas. Riparian Management Areas would serve to clarify proposed land allocations and help emphasize the protection the Forest Service is providing. A management area approach to riparian resources might also be more appropriate for forest modeling.

III. Assessment of Forest Service Preferred Alternative

The preferred alternative appears to threaten existing water uses both on- and off-Forest: "Fish hatcheries and potable water users downstream may be required to increase the amount of water treatment, or limit their use to fewer nonturbid periods under the preferred alternative." (DEIS, p. IV-25)

Watershed protection levels, levels of forest management activities, and monitoring effectiveness give cause for concern that water resources are not afforded sufficient protection under the preferred alternative. These concerns are documented below.

A. Comparison of Preferred to Other Alternatives

The Forest Service preferred Alternative (J) will be evaluated, in part, through a comparison with other selected alternatives. As a general comment in comparing alternatives, any alternative which proposes the least disruption to natural forest systems would probably have the greatest benefit for water quantity and downstream use.

The alternatives that help lend perspective to the land allocations and resource outputs in J are: Alternative C, with a non-market resource emphasis; Alternative F, the alternative which "would most closely continue the current blend of Forest management activities" (DEIS, p. IV-21); and Alternative I that emphasizes timber production.

Alternative C poses the least risk to the Forest's water resources. Under C: no harvest would be allowed in Class I and II riparian areas (DEIS, p. IV-18); erosion is held to the lowest level of any other alternative (DEIS, p. IV-22); the rate of landsliding is expected to decline (DEIS, p. IV-23); the harvest on unstable soils would be reduced by 32 percent over that projected under the current direction [Alternative F] (DEIS, p. IV-23); the least number of watersheds and the smallest area of any alternative would be in the "probable" cumulative effects category (DEIS, p. IV-32); and the forest would experience the highest level of hydrologic stability (DEIS, p. IV-34).

Nevertheless, under Alternative C: erosion is still elevated by 34 percent over natural background levels (DEIS, p. IV-21); timber harvest will take place on over 8,500 acres of potentially unstable soils (DEIS, p. IV-23); and six watersheds are put at risk of peak streamflow increase (DEIS, p. IV-27). Thus, although C poses the least risk to water resources of any other alternative, it still could significantly affect streams and watersheds.

Alternative I poses the most risk to water resources of any non-departure alternative. It entails harvesting on nearly 16,000 acres of unstable soils; produces 56 percent in excess of natural background erosion rates; drops 13 watersheds below threshold hydrologic stability levels; and places 11 watersheds in probable risk of cumulative effects.

The preferred Alternative will increase the following over levels projected under Alternative F, the current management direction:

Quantity	Amount of Increase
First Decade ASQ	51 MMBF per year
Percent of forest in "probable" watersheds	13 percent
Erosion	20,000 Cubic Yards (4%)
Harvest on unstable soils	2,200 acres
New Road Mileage through Decade 5	84 (13% over present)
First Decade Clearcuts	1200 acres

Thus, J clearly increases risks to water resources in comparison to how the Forest is currently managed.

Generally, the preferred alternative more closely resembles Alternative I (timber) than it does F (current). For example, its level of harvest (ASQ), budget, returns to federal government, erosion level, harvest on unstable soils, and percent of forest in "probable" watersheds (to list a few) are similar to levels proposed in I.

Water resources protection trade-offs increase from Alternatives C through I. These trade-offs involve increased harvest, and therefore reduced hydrologic stability. The increased harvest results from decreasing allocations for dispersed recreation (no harvest) areas, scenic retention areas, and wildlife protection areas. Much of the change between alternatives appears concentrated in the Santiam drainage. Protections afforded the southern half of the forest, while changing in size, are geographically similar. This suggests that as land allocations move from resource-protective alternatives to timber production alternatives, the Santiam drainage will be most at risk.

In summary, of the alternatives presented, C provides the greatest water resource protection. The preferred alternative, J, would increase the risk of water resource injury above current levels (as represented in Alternative F.)

Alternative J is quite similar to the timber harvest emphasis alternative, I. Alternative F offers more protection than J while also providing a relatively high level (87 % of J) of timber production. If the Forest is driven to compromise water resource protection, Alternative F would be preferable to J.

B. Watershed Comments

Under the preferred alternative, at least 39 percent of the National Forest would be in a hydrologically unrecovered (less than 75 percent of area in trees 8 inches or greater in diameter) condition (DEIS, p. IV-34). This is not in accordance with the management consideration described on DEIS p. III-17 which states that watersheds will be maintained at 75 percent hydrologic maturity.

In LRMP Appendix C, the Timber Sale Ten Year Action Plan, the Forest should indicate each timber sale's watershed. This information, which was provided by the Forest to the Water Resources Department, is very valuable. For example, it discloses the following regarding selected watersheds:

Watershed	Area (sq.mi.)	Clearcut (Acres)	New Roads (Miles)	Percent of Watershed in Rds. & Clearcuts
Quartzville Cr.	56	6052	44.7	17.2
Wiley Cr.	5	411	2.5	13.0
Quartz Cr.	25	1638	4.0	10.3
Winberry Cr.	35	2937	34.2	13.5
Hills Cr.	65	6628	40.3	16.2

All of the watersheds above are classified as sensitive (DEIS, p. III-31). Therefore, the recommended hydrologic stability level is about 80 percent — or roughly 20 percent in an immature, or cleared, condition. These watersheds are scheduled for a harvest level that approaches the threshold of concern. When the scheduled acreage is added to existing acreage in an unrecovered condition, in many cases the threshold would be exceeded.

This, in part, probably led the Forest Service to list these watersheds as having probable cumulative effects. But displaying the information explicitly provides reviewers a far better understanding of the forest activity the plan proposes. For example, harvesting 411 acres in Wiley Creek, an erosion-prone watershed with a minimum streamflow and municipal use, seems inappropriate. Why risk damage for 411 acres? The Forest should consider not programming any harvest in the Wiley Creek watershed.

The LRMP would place 11 watersheds (843 square miles) at risk of probable cumulative effects (DEIS, p. IV-32). As previously stressed, it seems inappropriate for the Forest Service to schedule the deterioration of its watersheds. Achieving hydrologic stability in forest watersheds should be a goal of the forest plan. An explicit array of forest activity information by watershed, along with the volume or value of timber in each, would provide a valuable yardstick by which to measure the costs of achieving hydrologic stability. The Forest Service should provide this information.

C. Riparian and Soil and Water Improvement Comments

On DEIS p. III-29, 13 watersheds are listed as having channel instability or sediment problems. Because no watershed or stream name information is

displayed, it is difficult to tell from inspecting Figure D-7 (Soil and Water Habitat Program Schedule, Appendix D-18, LRMP) how much work is scheduled for these watersheds. About 500 acres are scheduled for improvement according to Figure D-7. Without knowing the total number of acres identified in the Soil and Water Improvement inventory, it is hard to gage how well the proposed actions address watershed problems. The total number of acres identified through the Forest's Soil and Water Improvement Inventory should be displayed. In addition, watershed, stream name (where appropriate), and project description (erosion control, riparian rehab, etc.) should be provided in Figure D-7 (similar to that information provided in Figure D-9, Engineering Program Schedule).

Over 80 percent of the soil and water habitat improvement is scheduled for completion in the first three years of the plan. Over 50 percent takes place in the second year alone. Does this imply that some target is being achieved? Or is the schedule shown in Figure D-7 dependent on K-V funds and therefore reflect the level of timber harvest?

LRMP p. IV-12 states that "the amount of work accomplished will be dependent on funding availability as well as the occurrence of catastrophic flood events." Although this funding uncertainty will doubtless always be present, without further explanation it sounds like a loophole. In the goals section (LRMP, pp. IV-2,3), the Forest should state that rehabilitation of inventoried degraded sites is a high priority and will be pursued aggressively under any funding environment.

Riparian harvest seems out of balance with riparian management prescriptions. On LRMP p. IV-36, Figure IV-D-22 shows that over 300 MMBF will be harvested from riparian areas in the first decade. If only 10 percent of riparian areas can be in a harvested condition at any given time (LRMP, p. IV-62), then about 6300 acres are available for harvest from riparian areas. This quantity is reduced further by additional protections displayed on LRMP pp. IV-60 to 63. Is removing approximately 30 MMBF annually from less than 6300 acres likely?

C. Monitoring Comments

The Information Needs section (LRMP, p II-9) should include water quantity as an element in determining cumulative effects of timber harvest and road construction. The section should also list the research need mentioned on DEIS p. IV-16 —namely, what effect would larger stands of more vigorous trees have on net transpiration and water availability?

It is commendable that the Forest plans to monitor water quality on Class I and II streams and riparian area conditions. However, less than one-tenth of one percent of the projected first decade annual budget (DEIS, p. II-123) will be allocated to the monitoring effort. It would seem that, given the importance of water quality and riparian areas, greater attention in terms of staff resources is warranted. It is essential to determine as soon as possible if the Forest plan is providing the water resources protection intended. With a larger water monitoring budget, this determination could be made sooner. Also, with additional resources the reliability of

measurements might improve beyond the expected "low" levels as displayed in Figure V-C-1.

As mentioned elsewhere in these comments, the monitoring plan also offers an opportunity to address some of the information needs listed on LRMP p. II-9 or DEIS p. IV-16. In addition, an explicit delineation of Forest water quantity monitoring efforts would be appropriate in the monitoring plan section.

Municipal use should be added to the list of forest-dependent water uses on LRMP p. III-4. DEIS p. IV-25 states: "Though public supply watersheds are examined frequently for adverse impacts, they receive the same harvest intensities as do non-supply watersheds." If the sole caution applied by the Forest in protecting municipal supply is timing of examinations, the frequency of inspection should be explicitly stated in the monitoring plan (LRMP, p. V-8 to 22).

IV. Attachments

The following are attached:

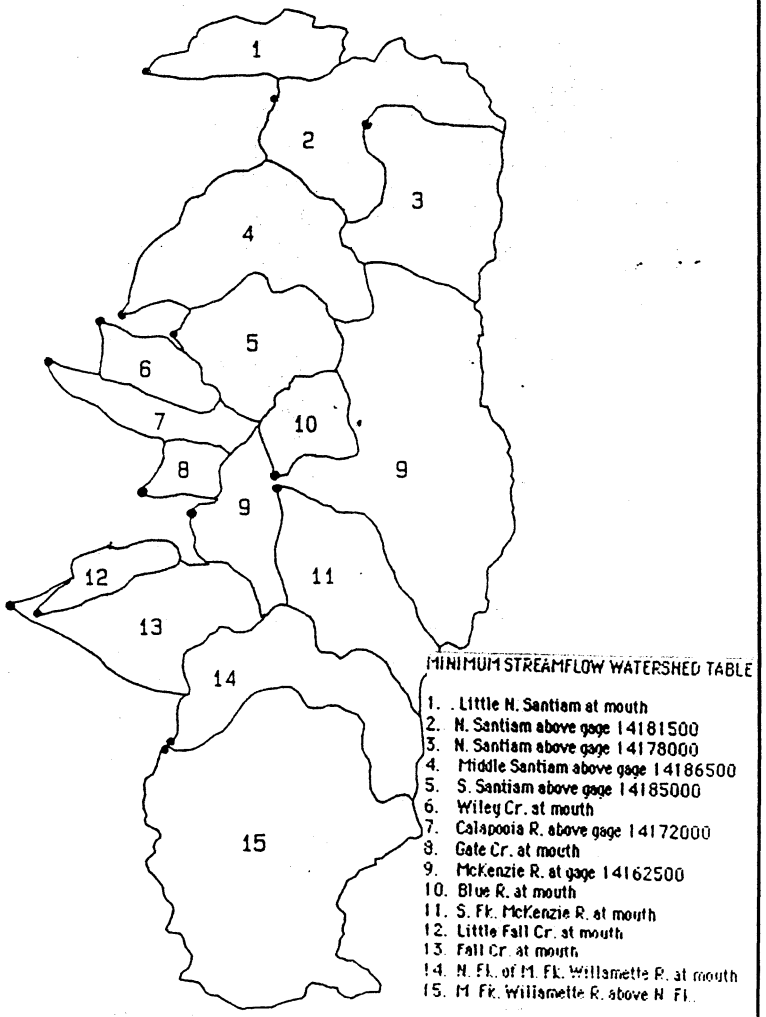
A. Mid Willamette Program
B. Upper Willamette Program
C. Map of Minimum Streamflow Basins

0939g

MINIMUM STREAMFLOWS & SUBBASINS

OF INTEREST TO THE WILLAMETTE NATIONAL FOREST

(scale same as that on DEIS p. III-19, basins approximate)



MINIMUM STREAMFLOW WATERSHED TABLE

1. Little N. Santiam at mouth
2. N. Santiam above gage 14181500
3. N. Santiam above gage 14178000
4. Middle Santiam above gage 14186500
5. S. Santiam above gage 14185000
6. Wiley Cr. at mouth
7. Calapooia R. above gage 14172000
8. Gate Cr. at mouth
9. McKenzie R. at gage 14162500
10. Blue R. at mouth
11. S. Fk. McKenzie R. at mouth
12. Little Fall Cr. at mouth
13. Fall Cr. at mouth
14. N. Fk. of M. Fk. Willamette R. at mouth
15. M. Fk. Willamette R. above N. Fk.

BEFORE THE WATER POLICY REVIEW BOARD

OF THE

STATE OF OREGON

In the matter of formulating an integrated, coordinated program for the use and control of the water resources of the Middle Willamette River Basin	)	Middle Willamette River Basin August 2, 1985*

WHEREAS the State Water Resources Board under the authority of ORS 536.300 has undertaken a study of the Middle Willamette River Basin as delineated on State Water Resources Board Map, File 2B. 70146;

WHEREAS results of this study have been published in the State Water Resources Board Report, Middle Willamette River Basin, dated June 1963;

WHEREAS in this study consideration was given to means and methods of augmenting, conserving, and classifying such water resources, existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife and fish life uses, and for pollution abatement as well as other related subjects including drainage, reclamation, and flood control; and

WHEREAS the Water Policy Review Board under ORS 536.300 through 536.340 has undertaken further studies of the development of the water resources of the Middle Willamette River Basin; and

WHEREAS as a result of those studies the following findings and conclusions were reached by this Board:

1. Total quantities of surface water on an average annual basis are adequate to meet existing and contemplated future needs for water.
2. There is insufficient surface yield during low-flow periods to meet present demands in many areas, and to meet future demands in most areas.
3. The ground water resource is inadequate in both quantity and quality in many areas to meet existing needs.
4. Augmentation of water supply during low-flow periods can come through storage of surplus runoff or the implementation of other measures.

* Modifies Middle Willamette River Basin Program dated June 22, 1964.

5. There are large quantities of unappropriated water which come under the jurisdiction of the Water Policy Review Board, the exact amount of which is undetermined.

6. There is an urgent need to adjudicate claims for the waters of the Upper, Middle, and Lower Willamette Basins to permit identification of unappropriated water, to relate the supply to both legal and actual use, and to permit proper planning for development to meet future needs.

7. Power claims at Willamette Falls, which date back to 1852, total about 30,000 cubic feet per second. This is equivalent to about 21 million acre-feet on an annual basis which is slightly more than the total average annual yield of the Upper and Middle Willamette Basins. There will be a cloud on all water rights issued subsequent to 1852 until these power claims are adjudicated.

8. Domestic, livestock, and wildlife uses, while important, represent comparatively small quantities of water in existing and contemplated future needs.

9. Municipal use is and will continue to be one of the major consumptive uses of water. Supply sources generally are adequate and many municipalities have obtained water rights for future expansion.

10. Normal precipitation during summer months is not sufficient in the Middle Willamette Basin to attain maximum crop production. Irrigation is required for some crops to realize maximum benefit from the land.

11. Irrigation is the major consumptive use of water and there are large areas of potentially irrigable land. Storage supplies are necessary for about 75 percent of the potentially irrigable land.

12. Industrial use is and will probably continue to be one of the major consumptive uses of water. Present municipal and industrial rights are generally more than adequate to meet estimated needs for 1985, but storage will be needed in some areas to provide a dependable supply.

13. Present mining use is small and is associated primarily with sand and gravel operations in which the consumptive use is minor.

14. The remaining hydroelectric potential of the basin that is economically feasible for development is small.

15. Recreational use of the streams and lakes of the basin is of major importance and is associated primarily with camping, boating, swimming, and sports fishing.

16. Cost and benefit allocations for existing projects will be reviewed and are subject to modification upon completion of the current Willamette Basin Review Study.

17. The Little North Santiam River, Wiley Creek, Breitenbush River, and the upper reaches of Calapooia River, North Santiam River, Middle Santiam River, South Santiam River, Molalla River, and the high mountain lakes provide outstanding recreational values and should have their use restricted primarily for recreational purposes.

18. Use of the basin's stream system by anadromous fish is of major importance, both to the basin and to the state.

19. Maintenance of adequate minimum streamflows is important to fish life, wildlife, recreation, and water quality control.

20. Fifteen minimum perennial streamflows included in the Senate Bill 225 (1983) application are located in the Middle Willamette River Basin.

21. Identified streams support important populations of anadromous and resident fish species.

22. The revised minimum perennial streamflows of the Oregon Department of Fish and Wildlife dated June 18, 1985, for Deer, Mill and Agency Creeks and the South Yamhill River are more appropriate for the support of aquatic life than those requested in the application of November 3, 1983.

23. Minimum perennial streamflows to assimilate treated waste and non-point source pollution on Silver Creek, Little Luckiamute River, and South Yamhill River are important for maintaining water quality and will benefit all instream uses.

24. Pollution of surface water is a serious problem in some streams in the basin during periods of low flow. For the foreseeable future, streamflow will be required for the assimilation of treated waste.

25. Serious damages, caused by flooding and erosion, are annual occurrences. Flood control structures in the Middle and Upper Willamette Basins have resulted in substantial benefits.

26. Drainage problems exist on a large portion of the basin's arable lands.

27. Physical and economic factors justify limited-purpose use of certain waters.

28. The construction and operation of all projects must be related to the various beneficial uses of water and to an overall comprehensive and orderly development of the water resources of the entire basin.

29. Low water temperatures are an outstanding characteristic of streams originating in the High Cascades. Water quality requirements will be served by maintaining thermal benefits resulting from the influence of Cascade streams and by enhancing thermal conditions in all streams where high water temperatues are now a problem.

NOW THEREFORE BE IT RESOLVED that this board hereby adopts the following program in accordance with ORS 536.300(2) pertaining to the water resources of the Middle Willamette Basin:

A. The maximum economic development of this state, the attainment of the highest and best use of the waters of the Middle Willamette Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development, industrial, mining recreation, wildlife, fish life and pollution abatement uses and the waters of the Middle Willamette Basin are hereby so classified with the following exceptions:

1. The maximum economic development of this state, the attainment of the highest and best use of the waters of the North Santiam River subbasin and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development, industrial, mining, recreation, wildlife and fish life uses and the waters of the North Santiam River are hereby so classified with the exceptions listed in Sections A-2 and A-3.

2. The maximum economic development of this state, the attainment of the highest and best use of the waters of all natural lakes of the Middle Willamette Basin situated above an elevation of 2,000 feet mean sea level, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, irrigation of lawn or noncommercial garden not to exceed one-half acre in area, power development not to exceed 7-1/2 theoretical horsepower, recreation, wildlife, and fish life uses and the waters of all natural lakes of the Middle Willamette Basin situated above an elevation of 2,000 feet mean sea level are hereby so classified.

3. The maximum economic development of this state, the attainment of the highest and best use of the waters of the upper reaches of the streams listed below, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, irrigation of lawn or noncommercial garden not to exceed one-half acre in area, power development not to exceed 7-1/2 theoretical horsepower, recreation, wildlife, and fish life uses, and the upper reaches of the following streams are hereby so classified:

   a. The Little North Santiam River and Henline Creek, and their tributaries, above their confluence (Section 33, Township 8 South, Range 4 East).

   b. Wiley and Little Wiley Creeks, and their tributaries, above their confluence (Section 7, Township 14 South, Range 2 East).

   c. The Breitenbush River and its tributaries.

   d. The Calapooia River, and its tributaries, above its confluence with Bigs Creek (Section 7, Township 15 South, Range 2 East).

   e. The North Santiam River, and its tributaries, above its confluence with Tunnel Creek (Section 20, Township 10 South, Range 7 East).

   f. The Middle Santiam River, and its tributaries, above the Green Peter Reservoir (Section 19, Township 12 South, Range 3 East).

   g. Quartsville Creek, and its tributaries, above its confluence with Panther Creek (Section 10, Township 12 South, Range 3 East).

   h. The South Santiam River, and its tributaries, above its confluence with Trout Creek (Section 32, Township 13 South, Range 4 East).

   i. The Molalla River, and Table Rock Fork, and their tributaries, above their confluence (Section 14, Township 7 South, Range 3 East).

B. For the purpose of maintaining a minimum perennial streamflow sufficient to support aquatic life, and of attaining the highest and best use of waters released from storage, no appropriations of water except for domestic or livestock uses or waters to be legally stored or legally released from storage shall be made or granted by any state agency or public corporation of the state for the following waters and as shown in Table 1.

Santiam Subbasin

Calapooia River

1. The Calapooia River or its tributaries above USGS Gage 14-1720 (SE 1/4, Section 15, Township 14 South, Range 1 West) at Holley, Oregon, for natural flows of the Calapooia River below 30 cubic feet per second plus waters released from storage of up to 340 cubic feet per second measured at the aforementioned gage.

2. The Calapooia River or its tributaries above USGS Gage 14-1735 (NW 1/4, Section 13, Township 11 South, Range 4 West) at Albany, Oregon, for natural flows of the Calapooia River below 20 cubic feet per second plus waters released from storage of up to 340 cubic feet per second measured at the aforementioned gage.

Santiam River

3. The South Santiam River or its tributaries above USGS - Corps of Engineers - State Engineer Gage 14-1850 (SE 1/4 Section 36, Township 13 South, Range 2 East) below Cascadia, Oregon, for flows of the South Santiam River below 50 cubic feet per second measured at the aforementioned gage.

4. The Middle Santiam River or its tributaries above USGS Gage 14-1865 (NE 1/4 SE 1/4 Section 24, Township 13 South, Range 1 East) near Foster, Oregon, for natural flows of the Middle Santiam River or its tributaries below 110 cubic feet per second plus waters released from storage of up to 260 cubic feet per second measured at the aforementioned gage.

5. Wiley Creek or its tributaries above Wiley Creek - South Santiam River confluence for flows of Wiley Creek below 10 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

6. The South Santiam River or its tributaries above USGS - Corps of Engineers - State Engineer Gage 14-1875 (SW 1/4 NW 1/4 Section 28, Township 12 South, Range 1 West) at Waterloo, Oregon, for natural flows of the South Santiam River below 170 cubic feet per second plus waters released from storage of up to 930 cubic feet per second measured at the aforementioned gage.

7. The North Santiam River or its tributaries above USGS Gage 14-1780 (SE 1/4 NW 1/4 Section 17, Township 10 S, Range 6 East) near Detroit, Oregon, for flows of the North Santiam River below 345 cubic feet per second measured at the aforementioned gage.

8. The North Santiam River or its tributaries above USGS Gage 14-1815 (NE 1/4 NE 1/4 Section 34, Township 9 South, Range 4 East) at Niagara, Oregon, for natural flows of the North Santiam River below 500 cubic feet per second plus waters released from storage of up to 640 cubic feet per second measured at the aforementioned gage.

9. The Little North Santiam River or its tributaries above USGS - State Engineer Gage 14-1825 (NW 1/4 Section 16, Township 9 South, Range 2 East) near Mehama, Oregon, for flows of the Little North Santiam River below 40 cubic feet per second measured at the aforementioned gage.

10. The North Santiam River or its tributaries above USGS Gage 14-1830 (NW 1/4 Section 18, Township 9 South, Range 2 East) at Mehama, Oregon, for natural flows of the North Santiam River below 580 cubic feet per second plus waters released from storage of up to 640 cubic feet per second measured at the aforementioned gage.

11. The North Santiam River or its tributaries above USGS Gage 14-1841 (Section 7, Township 10 South, Range 2 West) near Jefferson, Oregon, for natural flows of the North Santiam River below 430 cubic feet per second plus waters released from storage of up to 640 cubic feet per second measured at the aforementioned gage.

12. The Santiam River or its tributaries above USGS Gage 14-1890 (SE 1/4 Section 11, Township 10 South, Range 3 West) at Jefferson, Oregon, for natural flows of the Santiam River below 330 cubic feet per second plus waters released from storage of up to 1,570 cubic feet per second measured at the aforementioned gage.

13. The Santiam River or its tributaries above the Santiam River - Willamette River confluence for natural flows of the Santiam River below 320 cubic feet per second plus waters released from storage of up to 1,570 cubic feet per second measured at a point between the said confluence and 1.0 miles above said confluence.

Coast Subbasin

Marys River

14. The Marys River or its tributaries above USGS Gage No. 14-1710 (NE 1/4 SE 1/4 Section 18, Township 12 South, Range 5 West) near Philomath, Oregon, for flows of the Marys River below 10 cubic feet per second measured at the aforementioned gage.

15. The Marys River or its tributaries above the Marys River - Willamette River confluence for flows of the Marys River below 5 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

Luckiamute River

16. The Luckiamute River or its tributaries above USGS - State Engineer Gage 14-1895 (NE 1/4 Section 11, Township 10 South, Range 7 West) near Hoskins, Oregon for flows of the Luckiamute River below 10 cubic feet per second measured at the aforementioned gage.

17. The Luckiamute River or its tributaries above USGS Gage 14-1900 (SE 1/4 Section 33, Township 9 South, Range 6 West) at Pedee, Oregon, for flows of the Luckiamute River below 20 cubic feet per second measured at the aforementioned gage.

18. The Luckiamute River or its tributaries above USGS Gage 14-1905 (SW 1/4 SW 1/4 Section 18, Township 9 South, Range 4 West) near Suver, Oregon, for flows of the Luckiamute River below 25 cubic feet per second measured at the aforementioned gage.

19. The Luckiamute River or its tributaries above the Luckiamute River - Willamette River confluence for flows of the Luckiamute River below 20 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

Rickreall Creek

20. Rickreall Creek or its tributaries above USGS Gage No. 14-1907 (SE 1/4 SW 1/4 Section 35, Township 7 South, Range 6 West) near Dallas, Oregon, for flows of Rickreall Creek below 5 cubic feet per second measured at the aforementioned gage.

21. The South Yamhill or its tributaries above USGS - State Engineer Gage 14-1925 (Section 14, Township 6 South, Range 7 West) near Willamina, Oregon, for flows of the South Yamhill River below 20 cubic feet per second measured at the aforementioned gage.

22. Willamina Creek or its tributaries above USGS - Corps of Engineers - State Engineer Gage 14-1930 (near 1/4 corner Sections 12 and 13, Township 5 South, Range 7 West) near Willamina, Oregon, for flows of Willamina Creek below 20 cubic feet per second measured at the aforementioned gage.

23. The South Yamhill River or its tributaries above USGS Gage 14-1940 (NW 1/4 Section 5, Township 5 South, Range 4 West) near Whiteson, Oregon, for flows of the South Yamhill River below 15 cubic feet per second measured at the aforementioned gage.

24. The North Yamhill River or its tributaries above USGS Gage 14-1970 (NW 1/4 Section 25, Township 2 South, Range 5 West) at Pike, Oregon, for flows of the North Yamhill River below 10 cubic feet per second measured at the aforementioned gage.

25. The Yamhill River or its tributaries above USGS Gage 14-1975 - discontinued - (Section 7, Township 4 South, Range 3 West) at Lafayette, Oregon, for flows of the Yamhill River below 15 cubic feet per second measured at the aforementioned gage.

Molalla-Pudding Subbasin

Molalla River

26. The Molalla River or its tributaries above USGS - Corps of Engineers - State Engineer gage 14-1985 (SE 1/4 SE 1/4 Section 30, Township 6 South, Range 3 East) near Wilhoit, Oregon, for flows of the Molalla River below 35 cubic feet per second measured at the aforementioned gage.

27. The Molalla River or its tributaries above USGS Gage 14-2000 (Section 9, Township 4 South, Range 1 East) near Canby, Oregon, for flows of the Molalla River below 60 cubic feet per second measured at the aforementioned gage.

28. The Pudding River or its tributaries above USGS Gage 14-2010 (SE 1/4 Section 8, Township 6 South, Range 1 West) near Mt. Angel, Oregon, for flows of the Pudding River below 10 cubic feet per second measured at the aforementioned gage.

29. The Pudding River or its tributaries above USGS - State Engineer Gage 14-2020 (SE 1/4 Section 12, Township 4 South, Range 1 West) at Aurora, Oregon, for flows of the Pudding River below 35 cubic feet per second measured at the aforementioned gage.

Willamette River Mainstem

30. The Willamette River or its tributaries above USGS Gage 14-1740 (SW 1/4 Section 6, Township 11 South, Range 3 West) at Albany, Oregon, for natural flows of the Willamette River below 1,750 cubic feet per second plus waters released from storage of up to 3,140 cubic feet per second measured at the aforementioned gage.

31. The Willamette River or its tributaries above USGS Gage 14-1910 (SW 1/4 Section 22, Township 7 South, Range 3 West) at Salem, Oregon, for natural flows of the Willamette River below 1,300 cubic feet per second plus waters released from storage of up to 4,700 cubic feet per second measured at the aforementioned gage.

32. The Willamette River or its tributaries above USGS Gage 14-1980 (SE 1/4 Section 23, Township 3 South, Range 1 West) at Wilsonville, Oregon, for natural flows of the Willamette River below 1,500 cubic feet per second plus waters released from storage of up to 4,700 cubic feet per second measured at the aforementioned gage.

C. To support aquatic life and minimize pollution, in accordance with Section 3, Chapter 796, Oregon Laws, no appropriation of water shall be made or granted by any state agency of public corporation of the state for waters of McDowell Creek, Hamilton Creek, Carbtree Creek, and Thomas Creek in the Santiam Subbasin; Greasy Creek, Pedee Creek, Little Luckiamute River, Agency Creek, Willamina Creek, Mill Creek, Deer Creek and South Yamhill River in the Coast Subbasin; and Milk Creek, Silver Creek and Abiqua Creek in the Pudding-Molalla Subbasin and tributaries when flows are below the levels specified in Table 1. This limitation shall not apply to:

1. Domestic and livestock use.
2. Water legally stored or released from storage

Attainment of the specified flow levels during some portion of the year may require development of additional water storage or implementation of other measures to augment flows.

D. Applications for the use of the waters of the Middle Willamette Basin shall not be accepted by any state agency for any other purpose and the granting of applications for such other purposes is declared to be prejudicial to the public interest and the granting of applications for such other uses would be contrary to the integrated and coordinated program for the use and control of the water resources of the state.

E. Rights to use of water for industrial or mining purposes granted by any state agency shall be issued only on condition that any effluents or return flows from such uses shall not interfere with other beneficial uses.

MIDDLE WILLAMETTE RIVER BASIN
MINIMUM PERENNIAL STREAMFLOWS (Cubic Feet Per Second)

	OCT 1-15/16-31	NOV 1-15/16-30	DEC	JAN	FEB	MAR	APR	MAY	JUN 1-15/16-30	JUL 1-15/16-31	AUG 1-15/16-31	SEP 1-15/16-30	Priority Date
CALAPOOIA RIVER													
Calapooia River above gage 14172000 at Holley (SE 1/4, Sec 15, T14S, R1W)													
(natural flow)	30	30	30	30	30	30	30	30	30	30	30	30	6-22-64
(storage releases: up to)	340	340	340	340	340	340	340	340	340	340	340	340	6-22-64
Calapooia River above gage 14173500 at Albany (NW 1/4, Sec 13, T11S, R4W)													
(natural flow)	20	20	20	20	20	20	20	20	20	20	20	20	6-22-64
(storage releases: up to)	340	340	340	340	340	340	340	340	340	340	340	340	6-22-64
SANTIAM RIVER													
South Santiam River above gage 14185000 below Cascadia (SE 1/4, Sec 36, T13S, R2E)	50	50	50	50	50	50	50	50	50	50	50	50	6-22-64
Middle Santiam River above gage 14186500 near Foster (NE 1/4 SE 1/4, Sec 24, T13S, R1E)													
(natural flow)	110	110	110	110	110	110	110	110	110	110	110	110	6-22-64
(storage releases: up to)	260	260	260	260	260	260	260	260	260	260	260	260	6-22-64
Wiley Creek above the mouth	10	10	10	10	10	10	10	10	10	10	10	10	6-22-64
McDowell Creek at the mouth	10/20	45	45	45	45	45	45	45	15/10	8/5	3	3	11-3-83
South Santiam River above gage 14187500 at Waterloo (SW 1/4 NW 1/4, Sec 28, T12S, R1W)													
(natural flow)	170	170	170	170	170	170	170	170	170	170	170	170	6-22-64
(storage releases: up to)	930	930	930	930	930	930	930	930	930	930	930	930	6-22-64
Hamilton Creek at the mouth	10/20	40	40	40	40	40	40	40	15/10	8/5	3	3	11-3-83

F. Rights to use of water for power purposes granted by any state agency shall be issued only on condition that the project operation shall be compatible with other beneficial uses.

G. Structures or works for the utilization of the waters in accordance with the aforementioned classifications are also declared to be prejudicial to the public interest unless planned, constructed, and operated in conformity with the applicable provisions of ORS 536.310 and any such structures or works are further declared to be prejudicial to the public interest which do not give proper cognizance to the multiple-purpose concept.

Dated August 2, 1985

WATER POLICY REVIEW BOARD

William H. Young, Director
WATER RESOURCES DEPARTMENT

4587A

TABLE 1 CONTINUED
MIDDLE WILLAMETTE RIVER BASIN
MINIMUM PERENNIAL STREAMFLOWS (Cubic Feet Per Second)

	OCT 1-15/16-31	NOV 1-15/16-30	DEC	JAN	FEB	MAR	APR	MAY	JUN 1-15/16-30	JUL 1-15/16-31	AUG 1-15/16-31	SEP 1-15/16-30	Priority Date
MARYS RIVER													
Greasy Creek at the mouth	5/10	20/30	30	30	30	30	30	30	20/15	10/7	5	5	11-3-83
Marys River above gage 14171000 near Philomath (NE 1/4 SE 1/4, Sec 18, T12S, R5W)	10	10	10	10	10	10	10	10	10	10	10	10	6-22-64
Marys River at the mouth to be measured between the mouth and river mile 1.0	5	5	5	5	5	5	5	5	5	5	5	5	6-22-64
LUCKIAMUTE RIVER													
Luckiamute River above gage 14189500 near Haskins (NE 1/4, Sec 11, T10S, R7W)	10	10	10	10	10	10	10	10	10	10	10	10	6-22-64
Pedee Creek at the mouth	5/10	15/25	25	25	25	25	25	25	12/8	6/5	5	5	11-3-83
Luckiamute River above gage 1419000 at Pedee (SE 1/4, Sec 33, T9S, R6W)	20	20	20	20	20	20	20	20	20	20	20	20	6-22-64
Little Luckiamute River at Falls City and maintained to the Highway 223 crossing (Sec 36, T8S, R6W)	15/20	40/80	80	80	80	80	80	80	50/35	25/20	15	15	11-3-83
Luckiamute River above gage 14190500 near Suver (SW 1/4, SW 1/4, Sec 18, T9S, R4W)	25	25	25	25	25	25	25	25	25	25	25	25	6-33-64
Luckiamute River above the mouth to be measured between the mouth and river mile 1.0	20	20	20	20	20	20	20	20	20	20	20	20	6-22-64
RICKREALL CREEK													
Rickreall Creek above gage 14190700 near Dallas (SE 1/4, SW 1/4, Sec 35, T7S, R6W)	5	5	5	5	5	5	5	5	5	5	5	5	6-22-64

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MIDDLE WILLAMETTE RIVER BASIN
MINIMUM PERENNIAL STREAMFLOWS (Cubic Feet Per Second)

	OCT 1-15/16-31	NOV 1-15/16-30	DEC	JAN	FEB	MAR	APR	MAY	JUN 1-15/16-30	JUL 1-15/16-31	AUG 1-15/16-31	SEP 1-15/16-30	Priority Date
Crabtree Creek at the mouth	100	100	100	100	100	100	100	100	50/40	35/30	25/20	20/100	11-3-83
Thomas Creek at the mouth	100	100	100	100	100	100	100	100	50/40	35/30	25/20	20/100	11-3-83
North Santiam River above gage 14178000 near Detroit (SE 1/4 NW 1/4, Sec 17, T10S, R6E)	345	345	345	345	345	345	345	345	345	345	345	345	6-22-64
North Santiam River above gage 14181500 at Niagara (NE 1/4 NE 1/4, Sec 34, T9S, R4E)													
(natural flow)	500	500	500	500	500	500	500	500	500	500	500	500	6-22-64
(storage releases: up to)	640	640	640	640	640	640	640	640	640	640	640	640	6-22-64
Little North Santiam River above gage 14182500 near Mehama (NW 1/4, Sec 16, T9S, R2E)	40	40	40	40	40	40	40	40	40	40	40	40	6-22-64
North Santiam River above gage 14183000 at Mehama (NW 1/4, Sec 18, T9S, R2E)													
(natural flow)	580	580	580	580	580	580	580	580	580	580	580	580	6-22-64
(storage releases: up to)	640	640	640	640	640	640	640	640	640	640	640	640	6-22-64
North Santiam River above gage 14184100 near Jefferson (Sec 7, T10S, R2W)													
(natural flow)	430	430	430	430	430	430	430	430	430	430	430	430	6-22-64
(storage releases: up to)	640	640	640	640	640	640	640	640	640	640	640	640	6-22-64
Santiam River above gage 14189000 near Jefferson (SE 1/4, Sec 11, T10S, R3W)													
(natural flow)	330	330	330	330	330	330	330	330	330	330	330	330	6-22-64
(storage releases: up to)	1570	1570	1570	1570	1570	1570	1570	1570	1570	1570	1570	1570	6-22-64
Santiam River to be measured between the mouth and river mile 1.0													
(natural flow)	320	320	320	320	320	320	320	320	320	320	320	320	6-22-64
(storage releases: up to)	1570	1570	1570	1570	1570	1570	1570	1570	1570	1570	1570	1570	6-22-64

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MIDDLE WILLAMETTE RIVER BASIN
MINIMUM PERENNIAL STREAMFLOWS (Cubic Feet Per Second)

	OCT 1-15/16-31	NOV 1-15/16-30	DEC	JAN	FEB	MAR	APR	MAY	JUN 1-15/16-30	JUL 1-15/16-31	AUG 1-15/16-31	SEP 1-15/16-30	Priority Date
Milk Creek at the mouth													
	20/40	85	85	85	85	85	85	85	60/45	40/30	20	20	11-3-83
Molalla River above gage 14200000 near Canby (Sec 9, T4S, R1E)													
	60	60	60	60	60	60	60	60	60	60	60	60	6-22-64
Silver Creek from the City of Silverton maintained to the mouth													
	23/60	60	60	60	60	60	60	60	50/35	23	23	23	11-3-83
Abiqua Creek at the mouth													
	40/60	75	75	75	75	75	75	75	60/40	25/20	15	15	11-3-83
Pudding River above gage 14201000 near Mt. Angel (SE 1/4, Sec 8, T6S, R1W)													
	10	10	10	10	10	10	10	10	10	10	10	10	6-22-64
Pudding River above gage 14202000 at Aurora (SE 1/4, Sec 12, T4S, R1W)													
	35	35	35	35	35	35	35	35	35	35	35	35	6-22-64
WILLAMETTE RIVER													
Willamette River above gage 14174000 at Albany (SW 1/4, Sec 6, T11S, R3W)													
(natural flow)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	6-22-64
(storage releases: up to)	3140	3140	3140	3140	3140	3140	3140	3140	3140	3140	3140	3140	6-22-64
Willamette River above gage 14191000 at Salem (SW 1/4, Sec 22, T7S, R3W)													
(natural flow)	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	6-22-64
(storage releases: up to)	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	6-22-64
Willamette River above gage 14198000 at Wilsonville (SE 1/4, Sec 23, T3S, R1W)													
(natural flow)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	6-22-64
(storage releases: up to)	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	6-22-64

TABLE 1 CONTINUED

MIDDLE WILLAMETTE RIVER BASIN
MINIMUM PERENNIAL STREAMFLOWS (Cubic Feet Per Second)

	OCT 1-15/16-31	NOV 1-15/16-30	DEC	JAN	FEB	MAR	APR	MAY	JUN 1-15/16-30	JUL 1-15/16-31	AUG 1-15/16-31	SEP 1-15/16-30	Priority Date
YAMHILL RIVER													
Agency Creek at the mouth													
	20/40	80	80	80	80	80	80	80	25/20	15/10	8/6	6	11-3-83
South Yamhill River above gage 14192500 near Willamina (Sec 14, T6S, R6W)													
	20	20	20	20	20	20	20	20	20	20	20	20	6-22-64
Willamina Creek at gage 14193000 near Willamina (Sec 13, T5S, R7W)													
	20	20	20	20	20	20	20	20	20	20	20	20	6-22-64
Willamina Creek from gage 14193000 near Willamina (Sec 13, T5S, R7W) to the mouth													
	20/40*	70*	70*	70*	70*	70*	70*	70*	50/30*	20*	20*	20*	11-3-83
Mill Creek at the mouth													
	20/40	80	80	80	80	80	80	80	15/10	7/5	5	5	11-3-83
Deer Creek at the mouth													
	20/40	80	80	80	80	80	80	80	25/20	15/10	8/6	6	11-3-83
South Yamhill River above gage 14194000 near Whiteson (NW 1/4, Sec 5, T5S, R4W)													
	15	15	15	15	15	15	15	15	15	15	15	15	6-22-64
South Yamhill River from gage 14194000 near Whiteson (NW 1/4, Sec 5, T5S, R4W) to the mouth													
	150*	200*	200*	200*	200*	200*	200*	200*	150/100*	62*	62*	62*	11-3-83
North Yamhill River above gage 14197700 at Pike (NW 1/4, Sec 25, T2S, R5W)													
	10	10	10	10	10	10	10	10	10	10	10	10	6-22-64
Yamhill River above gage 14197500 at Lafayette (Sec 7, T4S, R3W)													
	15	15	15	15	15	15	15	15	15	15	15	15	6-22-64
MOLALLA RIVER													
Molalla River above gage 14198500 near Wilhart (SE 1/4, SE/14, Sec 30, T6S, R3E)													
	35	35	35	35	35	35	35	35	35	35	35	35	6-22-64

* Earlier priority date for all or part of the indicated flow.

BEFORE THE WATER POLICY REVIEW BOARD

OF THE

STATE OF OREGON

In the matter of formulating an integrated, coordinated program for the use and control of the water resources of the Upper Willamette River Basin	Upper Willamette River Basin May 30, 1985*

WHEREAS the State Water Resources Board under the authority of ORS 536.300 has undertaken a study of the Upper Willamette River Basin;

WHEREAS results of this study have been published in State Water Resources Board Report, Upper Willamette Basin;

WHEREAS in this study consideration was given to means and methods of augmenting, conserving, and classifying such water resources, existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fish life uses, and for pollution abatement as well as other related subjects including drainage, reclamation, and flood control; and

WHEREAS the Water Policy Review Board under ORS 536.300 and 536.340 has undertaken further studies of the development of the water resources of the Upper Willamette River Basin; and

WHEREAS as a result of these studies the following findings have been reached by this board:

1. The total quantity of water is sufficient on an average year basis to satisfy all existing and contemplated needs and uses of water.

2. Total yields are adequate in average years but geographical and seasonal maldistribution will result in water shortages in some areas where reliance is placed on natural streamflow.

3. Seasonal maldistribution of supply has been reduced in part by storage on major streams. Under construction, authorized, and recommended storage projects will further improve low flow conditions.

4. On most of the main streams of the basin supplies are adequate to meet existing rights. On small streams, particularly those originating in the Coast Range and parts of the lower Cascades, summer flows are not adequate to meet all existing rights simultaneously.

* Modifies Upper Willamette Basin Programs dated June 22, 1964 and November 10, 1980

5. Ground water supplies are available in varying quantities throughout the basin.

6. There are large quantities of unappropriated water which come under the jurisdiction of the State Water Resources Board, but precise quantities are undetermined.

7. There is need to adjudicate the waters of the Upper Willamette River Basin to determine existing rights.

8. Rural domestic water supplies come mainly from ground water sources. Many of the supplies are taken from low-yield aquifers and seasonal shortages are not uncommon.

9. Surface and ground water sources supplying municipal needs are adequate for existing and presently foreseeable needs.

10. Inadequate precipitation during the growing season results in a need for irrigation for most crops producing a high value per acre.

11. About 40 percent of the land holding irrigation rights was irrigated in 1950.

12. Contracts have been completed for use of stored water for irrigation from Corps of Engineers reservoirs to serve less than one percent of the irrigable land in the basin.

13. The expansion of irrigation from minor tributaries may require storage development within those areas.

14. Approximately one-third of the irrigable acreage is considered economically feasible of irrigation in the foreseeable future.

15. Water stored in existing and contemplated Corps of Engineers reservoirs will be adequate to supply anticipated irrigation needs for the major acreage in the basin.

16. Power development is presently an important use of water in the basin.

17. Major potential for additional power use is on the McKenzie River but development on the main stem of this stream would conflict with fish life and recreation uses.

18. The economic merit of additional power development in the basin has not been fully established.

19. There is substantial potential for industrial development in the basin particularly in the wood products and food processing industries.

20. Water supplies for these relatively major water-using industries are considered adequate.

21. It is anticipated that water for most potential minor water-using industries will be supplied from municipal sources.

22. Mining is not at present a significant use of water.

23. Present knowledge of mineral resources does not indicate major mining use of water in the foreseeable future.

24. Water-based recreation is a major economic and social value to the basin and to the state.

25. Recreation requirements for water are large and will continue to grow, probably at an accelerated rate.

26. The Willamette River Greenway, covering the mainstem of the Willamette River, Middle Fork Willamette River to Dexter Dam and Coast Fork Willamette River to Cottage Grove Dam, was established in 1973, to protect and preserve the natural, scenic, historical and recreational quality of the lands along the river.

27. Recreation requirements are mainly nonconsumptive in nature.

28. Recreation will conflict with other uses of water as development occurs.

29. Irrigation and power are authorized uses of water stored in Corps of Engineers reservoirs but recreation is permitted subject to the ultimate requirements of authorized purposes.

30. Reservoir recreation values cannot be maximized when project waters are released from storage for authorized downstream purposes.

31. Supplemental supplies will be needed to maximize recreation values.

32. The McKenzie River is superior as a natural recreation attraction.

33. The highest value of the natural lakes of the high Cascades is for existing and future recreation use.

34. Water consumption by wildlife does not represent a significant quantity.

35. The basin has a valuable fishery resource composed of anadromous species, resident trout, and warm-water game fish.

36. The basin has potential for enhancement of its fishery resource. Realization of this potential will depend in part upon improvements in low flow conditions and water quality.

37. Important streams and stream sections in the basin do not have sufficient flow in periods of low as well as critical flow to sustain minimum levels for nonconsumptive uses of fish life and recreation.

38. Maximum enhancement of the anadromous fishery potential will require improvement in fish passage and water quality in the lower Willamette River downstream of this basin.

39. Streams in the basin with little or no regulation cannot provide the desirable base flows for fish life recommended by the fisheries agencies.

40. Pollution abatement is a major problem in some areas.

41. Contamination of ground water supplies is a problem in some areas.

42. Industrial, commercial, agricultural, and population growth will add to the existing pollution problems.

43. The growth of additional urban fringe areas with improperly developed water supply and sewerage facilities will result in continuing or expanding pollution problems.

44. Some of the smaller streams and sections of major streams are unfit for some recreation uses because of pollution.

45. Continuing control of pollution must be maintained in order to protect the quality of water.

46. Utilization of flows to minimize pollution should not be permitted if such use limits or conflicts with the multiple-purpose concept.

47. Drainage is a problem, particularly on lands subject to periodic flooding.

48. Erosion is a problem in the basin. Bank erosion, due to prolonged high water stages resulting from releases of impounded flood waters, is a significant type.

49. Additional flood control storage will aggravate the bank erosion problem by extending the period of high discharge.

50. Flood control is a matter of major concern in the basin.

51. Substantial accomplishments have been made in flood damage reduction by flood control storage reservoirs.

52. Additional projects have been authorized and others recommended to further reduce flood damage.

53. Developments of many types are encroaching on the flood plain increasing damage potential and hazard to life.

54. Flood damage reduction by storage will have to be supplemented in the foreseeable future by other types of physical works, flood plain zoning, and floodproofing to provide the most economic solution to the remaining flood problem.

55. Major augmentation of the water resources in periods of need must come through storage of surplus runoff.

56. It is imperative that single-purpose development of available storage sites does not preclude full utilization of the resource.

57. Criteria for determination of desirable base flows commensurate with all beneficial uses of water have not been developed.

58. The results of the Upper Willamette River Basin study do not show any need for change or modification in the program adopted by the State Water Resources Board for the Upper McKenzie River, April 3, 1964.

59. Physical features, degree of economic development, and water-use requirements vary from subbasin to subbasin.

NOW THEREFORE BE IT RESOLVED that for the reason of variance in physical features, degree of economic development, and water-use requirements from subbasin to subbasin, the board adopts the following findings and issues program statements for each of the subbasins of the Upper Willamette River Basin.

WILLAMETTE COAST FORK

WHEREAS the State Water Resources Board under the authority of ORS 536.300 has undertaken a study of the Willamette Coast Fork Basin as delineated on State Water Resources Board Map, File No. 2A.7014;

WHEREAS in this study consideration was given to means and methods of augmenting, conserving, and classifying such water resources, existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fish life uses, and for pollution abatement as well as other related subjects including drainage, reclamation, and flood control; and

WHEREAS the Water Policy Review Board under ORS 536.300 and 536.340 has undertaken further studies of the development of the water resources of the Upper Willamette River Basin; and

WHEREAS as a result of these studies the following findings have been reached by this board:

1. The total quantity of water is sufficient on an average year basis to satisty all existing and contemplated needs and uses of water.

2. There is enough water on a critical year basis to meet existing and contemplated consumptive needs.

3. Maldistribution exists with regard to physical location and with respect to availability during time of need.

4. Ground water occurs in varying quantities throughout the basin.

5. The storage capacity or recharge rate of ground water aquifers has not been established.

6. Ground water is the major source for domestic needs.

7. Ground water supply is generally adequate for existing domestic and irrigation rights.

8. There is need to insure water for domestic, livestock, municipal, and wildlife uses which, while small, are of benefit to the state.

9. Potential exists for substantial expansion of irrigated lands.

10. Some potential exists for at-site power development.

11. Potential for expanded industrial use of water within this basin does not appear large.

12. Potential exists for expansion of mining uses but development is not expected to be great in the foreseeable future.

13. The basin has potential for expanded recreation use of water.

14. Improvement of water quality could enhance recreation potential, particularly on the main stem.

15. Full development of the fishery potential of the basin cannot be achieved without the improvement of low flow conditions.

16. The minimum perennial streamflows that can be established on the basis of existing rights and priorities are substantially lower on some streams than the flows recommended by the fisheries interests.

17. Desirable base flows for fish life cannot be realized unless additional water can be made available from storage.

18. Maintenance of minimum perennial streamflows would be in the public interest.

19. Utilization of flows to minimize pollution should only be permitted if it does not limit or conflict with the multiple-purpose objectives for water use in the basin.

20. Drainage problems exist but are not present or contemplated significant factors in water use.

21. Existing flood control reservoirs have materially reduced flood damages in the basin.

22. There are physically feasible storage sites in the basin. Certain storage sites are essential to the control of floods.

23. Development of additional storage, channel improvement, and land use regulations would reduce flood hazards.

24. Storage to the extent of complete elimination of flood damage is not economically feasible.

25. Certain river sections and numerous minor streams, creeks, and lakes are by nature of their physiography, location, land ownership, or economic potential available only for limited resource needs.

26. Establishment of restrictions on further appropriations on some streams would prevent an increase in depletion potential and aid in maintaining minimum flows.

NOW THEREFORE BE IT RESOLVED that this board hereby adopts the following program in accordance with ORS 536.300 (2) pertaining to the water resources of the Willamette Coast Fork Basin:

A. The maximum economic development of this state, the attainment of the highest and best use of the waters of the Willamette Coast Fork Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development, industrial, mining, recreation, wildlife, fish life and pollution abatement uses and the waters of the Willamette Coast Fork Basin are hereby so classified with the following exception:

> The maximum economic development of this state, the attainment of the highest and best use of the waters of the Layng Creek Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation of lawn or non-commercial garden not to exceed one-half

> acre in area, power development, recreation, wildlife, and fish life uses and the waters of Layng Creek Basin are hereby so classified. Diversions of the waters of Layng Creek and tributaries from the Layng Creek Basin shall be permitted for municipal use only.

B. For the purpose of maintaining a minimum perennial streamflow sufficient to support aquatic life, and of attaining the highest and best use of waters released from storage, no appropriations of water except for domestic or livestock uses or waters to be legally stored or legally released from storage, shall be made or granted by any state agency or public corporation of the state for the following waters and as shown on Table 1.

   1. The Willamette Coast Fork or its tributaries above the Willamette Coast Fork - Row River confluence for natural flows of the Willamette Coast Fork below 15 cubic feet per second, plus waters released from storage of up to 100 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

   2. Row River or its tributaries above the Row River - Willamette Coast Fork confluence for natural flows of the Row River below 40 cubic feet per second, plus waters released from storage of up to 150 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

   3. The Willamette Coast Fork or its tributaries above the Willamette Coast Fork - Willamette Middle Fork confluence for natural flows of the Willamette Coast Fork below 40 cubic feet per second, plus waters released from storage of up to 250 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

C. Applications for the use of the waters of the Willamette Coast Fork Basin shall not be accepted by any state agency for any other use and the granting of applications for such other uses is declared to be prejudicial to the public interest and the granting of applications for such other uses would be contrary to the integrated and coordinated program for the use and control of the water resources of the state.

D. Rights to use of water for industrial or mining purposes granted by any state agency shall be issued only on condition that any effluents or return flows from such uses shall not interfere with other beneficial uses.

E. Structures or works for the utilization of the waters in accordance with the aforementioned classifications are also declared to be prejudicial to the public interest unless planned, constructed, and operated in conformity with the applicable provisions of ORS 536.310 and any such structures or works are further declared to be prejudicial to the public interest which do not give proper cognizance to the multiple-purpose concept.

WILLAMETTE MIDDLE FORK

WHEREAS the State Water Resources Board under the authority of ORS 536.300 has undertaken a study of the Willamette Middle Fork Basin as delineated on State Water Resources Board Map, File No. 2A.7014;

WHEREAS in this study consideration was given to means and methods of augmenting, conserving, and classifying such water resources, existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fish life uses, and for pollution abatement as well as other related subjects including drainage, reclamation, and flood control; and

WHEREAS the Water Policy Review Board under ORS 536.300 and 536.340 has undertaken further studies of the development of the water resources of the Upper Willamette River Basin; and

WHEREAS as a result of these studies the following findings have been reached by this board:

1. The total quantity of water is sufficient on an average year basis to satisfy all existing and contemplated needs and uses of water.
2. There is enough water on a critical year basis to meet existing and contemplated consumptive needs and minimum nonconsumptive public uses.
3. Many streams in the basin do not provide enough flow for nonconsumptive public uses at present in periods of relatively low as well as critical flow.
4. Flows, unless augmented by storage, would not be sufficient on many streams during the summer months of critically low flow years to supply future consumptive and nonconsumptive demands.
5. Maldistribution exists with regard to physical location and with respect to availability during time of need.
6. Ground water occurs in varying quantities throughout the basin. It is concentrated in economic quantities only in alluvial deposits in the valley lowlands.

TABLE 1 COAST FORK WILLAMETTE SUBBASIN
MINIMUM PERENNIAL STREAMFLOWS
(cubic feet per second)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Priority Date
Coast Fork Willamette River above the confluence with Row River													
	15	15	15	15	15	15	15	15	15	15	15	15	6-22-64
(additional from storage releases only)	100	100	100	100	100	100	100	100	100	100	100	100	6-22-64
Row River at mouth													
	40	40	40	40	40	40	40	40	40	40	40	40	6-22-64
(additional from storage releases only)	150	150	150	150	150	150	150	150	150	150	150	150	6-22-64
Coast Fork Willamette River at mouth													
	40	40	40	40	40	40	40	40	40	40	40	40	6-22-64
(additional from storage releases only)	250	250	250	250	250	250	250	250	250	250	250	250	6-22-64

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7. The storage capacity or recharge rate of ground water aquifers has not been established.

8. Ground water supplies are adequate for existing rights.

9. There is need to insure water for domestic, livestock, municipal, and wildlife uses which, while small, are of benefit to the state.

10. Extensive expansion of irrigation is not expected in this basin. The net irrigable area will undoubtedly be reduced by lands utilized for roads, urban areas, and industry.

11. Current economics appear to justify the development of the additional power generating potential within the basin. Power development could conflict with other beneficial uses of the waters especially recreation and fish life.

12. There is potential for expanded industrial use of water within this basin.

13. Mining will not be a significant factor in water utilization in the foreseeable future.

14. Recreation use of the waters of the basin has been increasing and greater water-based recreation use can be expected in the future.

15. The natural lakes of the Willamette Middle Fork Basin have a high recreation potential.

16. Waldo Lake and North Fork of the Middle Fork Willamette River above Westfir were designated as state scenic waterways in 1983.

17. Anadromous fishery potential is limited by Dexter Dam to the lower Willamette Middle Fork and the Fall Creek system.

18. Hills Creek near Jasper, Little Fall Creek and Lost Creek are important anadromous fish streams downstream of Dexter and Fall Creek Dams.

19. Utilization of flows to minimize pollution should only be permitted if it does not limit or conflict with the multiple-purpose objectives for water use in the basin.

20. Drainage and reclamation of drained lands are not present and contemplated significant factors in water use.

21. Bank erosion resulting from near bankfull reservoir releases is a major problem.

22. Reservoirs completed, under construction, and authorized will control effectively all historical floods in the Willamette Middle Fork Basin.

23. Maintenance of minimum perennial streamflows would be in the public interest.

24. Establishment of restrictions on further appropriations on some streams would prevent an increase in depletion potential and aid in maintaining minimum flows.

25. Certain river sections and numerous minor streams, creeks, and lakes are by nature of their physiography, location, land ownership, or economic potential available only for limited resource needs.

NOW THEREFORE BE IT RESOLVED that this board hereby adopts the following program in accordance with ORS 536.300 (2) pertaining to the water resources of the Willamette Middle Fork Basin:

A. The maximum economic development of this state, the attainment of the highest and best use of the waters of the Willamette Middle Fork Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development, industrial, mining, recreation, wildlife, fish life and pollution abatement uses and the waters of the Willamette Middle Fork Basin are hereby so classified with the following exceptions:

1. The maximum economic development of this state, the attainment of the highest and best use of the waters of all natural lakes of the Willamette Middle Fork Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, irrigation of lawns or noncommercial garden not to exceed one-half acre in area, recreation, wildlife, and fish life uses and the waters of all natural lakes of the Willamette Middle Fork Basin are hereby so classified.

2. The maximum economic development of this state, the attainment of the highest and best uses of the waters of Salt Creek, Salmon Creek, and their tributaries; and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, irrigation of lawn or noncommercial garden not to exceed one-half acre in area, power development not to exceed 7 1/2 theoretical horsepower, recreation, wildlife and fish life uses and the waters of Salt Creek, Salmon Creek, and their tributaries are hereby so classified.

TABLE 2
MIDDLE FORK WILLAMETTE SUBBASIN
MINIMUM PERENNIAL STREAMFLOWS
(cubic feet per second)

	OCT	NOV 1-15/16-30	DEC	JAN	FEB	MAR	APR	MAY	JUN 1-15/16-30	JUL 1-15/16-30	AUG	SEP	Priority Date
Middle Fork Willamette River above confluence with North Fork													
	285	285	285	285	285	285	285	285	285	285	285	285	6-22-64
(additional from storage releases only)	690	690	690	690	690	690	690	690	690	690	690	690	6-22-64
North Fork of the Middle Fork at mouth													
	115	115	115	115	115	115	115	115	115	115	115	115	6-22-64
Lost Creek at mouth													
	3	30/50	50	50	50	50	50	50	25/15	8/6	3	3	11-3-83
Little Fall Creek at mouth													
	10	60/80	80	80	80	80	80	80	60/40	25/15	10	10	11-3-83
Fall Creek at mouth													
	40	40	40	40	40	40	40	40	40	40	40	40	6-22-64
(additional from storage releases only)	470	470	470	470	470	470	470	470	470	470	470	470	6-22-64
Hills Creek at mouth (near Jasper)													
	1	6/12	12	12	12	12	12	12	8/4	2	1	1	11-3-83
Middle Fork Willamette River at mouth													
	640	640	640	640	640	640	640	640	640	640	640	640	6-22-64
(additional from storage releases only)	1475	1475	1475	1475	1475	1475	1475	1475	1475	1475	1475	1475	6-22-64

3. The maximum economic development of this state, the attainment of the highest and best use of waters of the mainstem of the Willamette Middle Fork from its confluence with the Coast Fork of the Willamette River to Hills Creek Dam and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development not to exceed 7 1/2 theoretical horsepower, industrial, mining, recreation, wildlife, fish life and pollution abatement uses and the waters of the mainstem of the Willamette Middle Fork from its mouth to Hills Creek Dam.

4. The maximum economic development of this state, the attainment of the highest and best use of the waters of the mainstem of the North Fork of the Willamette Middle Fork in its entirety and the attainment of an integrated coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development not to exceed 7-1/2 theoretical horsepower, industrial, mining, recreation, wildlife and fish life uses and are so classified.

For the purpose of maintaining a minimum perennial streamflow sufficient to support aquatic life, and of attaining the highest and best use of waters released from storage, no appropriations of water except for domestic or livestock uses or waters to be legally stored or legally released from storage shall be made or granted by any state agency or public corporation of the state for the following waters and as shown on Table 2.

1. The Willamette Middle Fork or its tributaries above the Willamette Middle Fork - North Fork of the Willamette Middle Fork confluence for natural flows of the Willamette Middle Fork below 285 cubic feet per second, plus waters released from storage of up to 690 cubic feet per second measured at a point between said confluence and 1.0 miles a above said confluence.

2. The North Fork of the Willamette Middle Fork or its tributaries above the North Fork of the Willamette Middle Fork - Willamette Middle Fork confluence for flows of the North Fork below 115 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

3. Fall Creek or its tributaries above the Fall Creek - Willamette Middle Fork confluence for natural flows of Fall Creek below 40 cubic feet per second, plus waters released from storage of up to 470 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

4. The Willamette Middle Fork or it tributaries above the Willamette Middle Fork - Willamette Coast Fork confluence for natural flows of the Willamette Middle Fork below 640 cubic feet per second, plus waters released from storage of up to 1,475 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

C. To support aquatic life and minimize pollution, in accordance with Section 3, Chapter 796, Oregon Laws, 1983, no appropriation of water shall be made or granted by any state agency or public corporation of the state for waters of Lost Creek, Little Fall Creek, Hills Creek and tributaries when flows are below the levels specified in Table 2. This limitation shall not apply to:

1. Domestic and livestock consumption
2. Water legally released from storage.

D. Applications for the use of the waters of the Willamette Middle Fork Basin shall not be accepted by any state agency for any other use and the granting of applications for such other uses is declared to be prejudicial to the public interest and the granting of applications for such other uses would be contrary to the integrated and coordinated program for the use and control of the water resources of the state.

E. Rights to use of water for industrial or mining purposes granted by any state agency shall be issued only on condition that any effluents or return flows from such uses shall not interfere with other beneficial uses.

F. Structures or works for the utilization of the waters in accordance with the aforementioned classifications are also declared to be prejudicial to the public interest unless planned, constructed, and operated in conformity with the applicable provisions of ORS 536.310 and any such structures or works are further declared to be prejudicial to the public interest which do not give proper cognizance to the multiple-purpose concept.

WILLAMETTE-McKENZIE RIVER

WHEREAS the State Water Resources Board under the authority of ORS 536.300 has undertaken a study of the Willamette-McKenzie River Basin as delineated on State Water Resources Board Map, File No. 2A.7014;

WHEREAS in this study consideration was given to means and methods of augmenting, conserving, and classifying such water resources, existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fish life uses, and for pollution abatement as well as other related subjects including drainage, reclamation, and flood control; and

WHEREAS the Water Policy Review Board under ORS 536.300 and 536.340 has undertaken further studies of the development of the water resources of the Upper Willamette River Basin; and

WHEREAS as a result of these studies the following findings have been reached by this board:

1. The total quantity of water is sufficient on an average year basis to satisfy all existing and contemplated needs and uses of water.

2. Several streams in the basin do not provide enough water for consumptive requirements during low flow periods or seasonal shortage.

3. Maldistribution exists with regard to physical location and with respect to availability during time of need.

4. Ground water occurs in varying quantities throughout the basin but the quantitative amounts available for developement have not been determined.

5. Ground water supply is generally adequate for existing domestic, municipal, and irrigation rights.

6. There is need to insure water for domestic, livestock, and wildlife uses which, while small, are of benefit to the state.

7. Municipal requirements represent a significant factor in water utilization of the basin.

8. Water supplies are adequate to meet municipal needs in the foreseeable future.

9. Unused surface water rights for out-of-basin irrigation represent a material depletion potential of the waters of the basin.

10. Irrigable land along the lower McKenzie River is being withdrawn from agriculture at a rapid rate.

11. Irrigation water demands will not exceed existing supplies.

12. Natural streamflow of the Mohawk River and Camp Creek is inadequate to support an increase in irrigation.

13. There are physically feasible storage sites existing on the Mohawk River and Camp Creek which could be utilized to irrigate additional lands.

14. There is substantial power potential within the basin.

15. Potential power development would cause conflicts with recreation and fish life uses.

16. The State Water Resources Board Program, April 3, 1964, precludes utilization of the waters of the McKenzie River above Middle Falls for power purposes.

17. There is substantial potential for industrial development in the basin particularly in the wood products and food processing industries.

18. Water supplies for these relatively major water-using industries are considered adequate.

19. There are no existing water rights for mining operations in the basin. Potential for such use of water appears to be minor.

20. Water-based recreation is a major use of water and an important factor in the economy of the basin.

21. The basin has potential for expanded recreation use of water.

22. The McKenzie River is superior as a natural recreation attraction.

23. There are potential water uses on the McKenzie main stem that could have substantial adverse impact on recreation values.

24. Recreation use in the basin is increasing. Greater use can be expected in the future.

25. The McKenzie River system supports an extensive trout population and is a major spawning area for spring chinook in the Willamette River system.

26. Game fish are important to recreation use in the basin and problems affecting fish life have a direct bearing on recreation use, existing and potential.

27. Development of the fishery potential of the Mohawk River requires improvement of water supply and quality.

28. Attainment of flows recommended by the fisheries interests will be achieved only through storage.

29. Maintenance of minimum perennial streamflows would be in the public interest.

30. Utilization of flows to minimize pollution should not be permitted if such use limits or conflicts with the multiple-purpose concept.

31. Drainage problems occur in almost all agricultural areas.

32. The basin experiences major flood damage.

33. Flood damage reduction by storage will have to be supplemented in the foreseeable future by other types of physical works, flood plain zoning, and floodproofing to provide the most economic solutions to the remaining flood problem.

34. There are physically feasible storage sites within the basin.

35. Construction of flood control and power reservoirs could provide opportunities for reservoir-type recreation.

36. Certain river sections and numerous minor streams, creeks, and lakes are by nature of their physiography, location, land ownership, or economic potential available only for limited resource needs.

37. Establishment of restrictions on further appropriations on some streams would prevent an increase in depletion potential and aid in maintaining minimum flows.

38. The results of the Upper Willamette Basin study do not show any need for change or modification of the program adopted by the State Water Resources Board for the Upper McKenzie River, April 3, 1964.

NOW THEREFORE BE IT RESOLVED that this board hereby adopts the following program in accordance with ORS 536.300 (2) pertaining to the water resources of the Willamette-McKenzie River Basin:

A. The maximum economic development of this state, the attainment of the highest and best use of the waters of the Willamette-McKenzie River Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fish life uses and the waters of the Willamette-McKenzie River Basin are hereby so classified with the following exceptions:

   1. The McKenzie drainage above the Linn-Lane County line is covered by the Upper McKenzie River Basin program, April 3, 1964, and is hereby adopted as a part of the Upper Willamette Basin program.

TABLE 3
MCKENZIE RIVER SUBBASIN
MINIMUM PERENNIAL STREAMFLOW
(cubic feet per second)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Priority Date
South Fork McKenzie River at mouth													
	200	200	200	200	200	200	200	200	200	200	200	200	6-22-64
(additional from storage releases only)	230	230	230	230	230	230	230	230	230	230	230	230	6-22-64
Blue River at mouth													
	30	30	30	30	30	30	30	30	30	30	30	30	6-22-64
(additional from storage releases only)	350	350	350	350	350	350	350	350	350	350	350	350	6-22-64
McKenzie River at USGS Gage 14162900 in Sec. 5, T.17S., R.3E.													
	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	6-22-64
(additional from storage releases only)	580	580	580	580	580	580	580	580	580	580	580	580	6-22-64
Gate Creek at mouth													
	20	20	20	20	20	20	20	20	20	20	20	20	6-22-64
Mohawk River at mouth													
	20	20	20	20	20	20	20	20	20	20	20	20	6-22-64
McKenzie River at Interstate Highway 5 Bridge Sec. 10, T.17S., R.3W.													
	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	6-22-64
(additional from storage releases only)	700	700	700	700	700	700	700	700	700	700	700	700	6-22-64

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2. The maximum economic development of this state, the attainment of the highest and best use of the waters of all natural lakes of the Willamette-McKenzie River Basin, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, irrigation of lawn or noncommercial garden not to exceed one-half acre in area, recreation, wildlife, and fish life uses and the waters of all natural lakes of the Willamette-McKenzie River are hereby so classified.

3. The power potential of the South Fork McKenzie River, from near its confluence with the McKenzie River upstream to Cougar Dam, should be utilized.

4. The maximum economic development of this state, the attainment of the highest and best use of the waters of the McKenzie River mainstem from its mouth to the Linn-Lane County Line, with the aforementioned exceptions, and the attainment of an integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development not to exceed 7 1/2 theoretical horsepower, recreation, wildlife, and fish life uses and the waters of the McKenzie River mainstem from its mouth to Linn-Lane County line are hereby so classified.

B. For the purpose of maintaining a minimum perennial streamflow sufficient to support aquatic life, and of attaining the highest and best use of waters released from storage no appropriations of water except for domestic or livestock uses or waters to be legally stored or legally released from storage shall be made or granted by any state agency or public corporation of the state for the following waters and as shown on Table 3.

1. The South Fork McKenzie River or its tributaries above the South Fork McKenzie River - McKenzie River confluence for natural flows of the South Fork McKenzie River below 200 cubic feet per second, plus waters released from storage of up to 230 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

2. Blue River or its tributaries above the Blue River - McKenzie River confluence for natural flows of Blue River below 30 cubic feet per second, plus waters released from storage of up to 350 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

3. The McKenzie River or its tributaries above U.S.G.S. - State Engineer Gage No. 14-1625 (NE 1/4 Section 5, Township 17 S., Range 3 E.) near Vida, Oregon for natural flows of the McKenzie River below 1,400 cubic feet per second plus waters released from storage of up to 580 cubic feet per second measured at the aforementioned gage.

4. Gate Creek or its tributaries above the Gate Creek - McKenzie River confluence for flows of Gate Creek below 20 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

5. Mohawk River or its tributaries above the Mohawk River - McKenzie River confluence for flows of the Mohawk River below 20 cubic feet per second measured at a point between said confluence and 1.0 miles above said confluence.

6. The McKenzie River or its tributaries above the intersection of the McKenzie River and Interstate Highway 5 for natural flows of the McKenzie River below 1,025 cubic feet per second, plus waters released from storage of up to 700 cubic feet per second, measured at the intersection of the McKenzie River and Interstate Highway 5.

C. Applications for the use of the waters of the Willamette-McKenzie River Basin shall not be accepted by any state agency for any other use and the granting of applications for such other uses is declared to be prejudicial to the public interest and the granting of applications for such other uses would be contrary to the integrated and coordinated program for the use and control of the water resources of the state.

D. Rights to use of water for industrial or mining purposes granted by any state agency shall be issued only on condition that any effluents or return flows from such uses shall not interfere with other beneficial uses.

E. Structures or works for the utilization of the waters in accordance with the aforementioned classifications are also declared to be prejudicial to the public interest unless planned, constructed, and operated in conformity with the applicable provisions of ORS 536.310 and any such structures or works are further declared to be prejudicial to the public interest which do not give proper cognizance to the multiple-purpose concept.

WILLAMETTE RIVER MAINSTEM
AND
LONG TOM RIVER

WHEREAS the State Water Resources Board under the authority of ORS 536.300 has undertaken a study of the Willamette River Main Stem and Long Tom River as delineated on State Water Resources Board Map, File No. 2A.7014;

WHEREAS in this study consideration was given to means and methods of augmenting, conserving, and classifying such water resources, existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fish life uses, and for pollution abatement as well as other related subjects including drainage, reclamation, and flood control; and

WHEREAS the Water Policy Review Board under ORS 536.300 and 536.340 has undertaken further studies of the development of the water resources of the Upper Willamette River Basin; and

WHEREAS as a result of these studies the following findings have been reached by this board:

1. The total quantity of water is sufficient on an average year basis to satisfy all existing and contemplated needs and uses of water.

2. Any significant expansion of consumptive use will intensify shortages during low flow periods of the summer months.

3. Flows, unless augmented by storage, will not be sufficient on most streams during the summer months of low flow years to supply future consumptive and nonconsumptive demands.

4. Maldistribution exists with regard to physical location and with respect to availability during time of need.

5. Ground water occurs in varying quantities throughout the basin. It is concentrated in economic quantities only in alluvial deposits in the valley lowlands.

6. Ground water supplies are inadequate in some areas to satisfy existing rights.

7. Ground water supplies a major portion of domestic water utilized in the basin.

8. Major municipal water supplies are obtained from sources outside this basin.

9. Existing sources of municipal water for cities obtaining water supplies in the basin appear to be adequate.

10. There is need to insure water for domestic, livestock, and municipal uses which, while small, are of benefit to the state.

11. Irrigation is an authorized use of water stored in Fern Ridge Reservoir.

12. Adequately irrigated agricultural lands represent only a small percentage of the total potentially irrigable area.

13. Storage of winter runoff from additional reservoirs, releases from constructed, under construction, authorized, and recommended reservoirs; and ground water could provide sufficient quantities to satisfy future irrigation needs.

14. There is some power potential in the basin.

15. Industrial use will be a major factor in the economy of the basin.

16. There are no water rights for mining purposes. No significant use is anticipated in the foreseeable future.

17. Recreation is a significant use of water.

18. Major recreation use of water occurs at Fern Ridge Reservoir and on the mainstem Willamette River.

19. Recreation, which is not an authorized use of Fern Ridge Reservoir, is subject to the ultimate requirements of the authorized purposes.

20. Releases from upstream storage to replace waters withdrawn from Fern Ridge Reservoir for authorized purposes could materially assist in maintaining recreation values.

21. Water consumption by wildlife does not represent a significant quantity.

22. The Willamette River mainstem is important for anadromous fish migration and spawning and support of several resident fish species.

23. Attainment of minimum streamflows in the Willamette River mainstem will require negotiation and agreements with the Corps of Engineers for release of stored water.

24. Maintenance of minimum perennial streamflows would be in the public interest.

25. Material improvement in minimum low flows cannot be achieved without the development of storage.

26. Attainment of flows recommended by the fisheries interests will be achieved only through storage during some months.

27. Pollution abatement will continue to be of major importance in maintaining instream beneficial uses.

28. Increases of population and the need to serve presently unsewered areas, will require municipal sewerage works to be expanded.

29. Utilization of flows to minimize pollution should only be permitted if it does not limit or conflict with the multiple-purpose objectives for water use in the basin.

30. Drainage of agricultural and suburban lands is a major problem in the basin.

31. There are flood problems in the basin.

32. Existing flood control reservoirs have materially reduced flood damages.

33. There are physically feasible storage sites in the basin.

34. Certain river sections and numerous minor streams and creeks are by nature of their physiography, location, land ownership, or economic potential available only for limited resource needs.

35. Establishment of restrictions on further appropriations on some streams would prevent an increase in depletion potential and aid in maintaining minimums where streams are not now appropriated beyond their natural capacity at critical points.

NOW THEREFORE BE IT RESOLVED that this board hereby adopts the following program in accordance with ORS 536.300 (2) pertaining to the water resources of the Willamette River Main Stem - Long Tom River Basin:

A. The maximum economic development of this state, the attainment of the highest and best use of the waters of the Willamette River Main Stem - Long Tom River Basin, and the attainment of an

integrated and coordinated program for the benefit of the state as a whole will be furthered through utilization of the aforementioned waters only for domestic, livestock, municipal, irrigation, power development, industrial, mining, recreation, wildlife, fish life and pollution abatement uses and the waters of the Willamette River Main Stem - Long Tom River Basin are hereby so classified with the following exception:

No application for appropriation of water shall be accepted or issued by any state agency except appropriations for domestic or livestock use or appropriations for beneficial use involving water legally stored in excess of or that necessary for existing rights, of the waters of Coyote and Spencer Creeks.

B. For the purpose of obtaining the highest and best use of waters released from storage, no appropriations of water except for domestic or livestock uses shall be made or granted by any state agency or public corporation of the state from the Long Tom River above U.S.G.S. Gage No. 14-1700 (NE 1/4 Section 33, Township 14 S., Range 5 W.) at Monroe, Oregon for waters released from storage of up to 370 cubic feet per second measured at the aforementioned gage (Table 4).

C. To support aquatic life and minimize pollution, in accordance with Section 3, Chapter 796, Oregon Laws, 1983, no appropriation of water shall be made or granted by any state agency or public corporation of the state for waters of the mainstem Willamette River and tributaries when flows are below the levels specified in Table 4. This limitation shall not apply to:

1. Domestic and livestock consumption.
2. Water legally released from storage for other purposes.

Attainment of the specified flow levels during some portion of the year will require use of stored water to augment flows.

D. Applications for the use of the waters of the Willamette River Main Stem - Long Tom River Basin shall not be accepted by any state agency for any other use and the granting of applications for such other uses is declared to be prejudicial to the public interest and the granting of applications for such other uses would be contrary to the integrated and coordinated program for the use and control of the water resources of the state.

E. Rights to use of water for industrial or mining purposes granted by any state agency shall be issued only on condition that any effluents or return flows from such uses shall not interfere with other beneficial uses.

TABLE 4
MAINSTEM WILLAMETTE-LONG TOM SUBBASIN
MINIMUM PERENNIAL STREAMFLOW
(cubic feet per second)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Priority Dat
Willamette River from the confluence of Coast Fork and Middle Fork to the confluence with the McKenzie River													
	2000	2500	2500	2500	2500	2500	2500	2500	2000	2000	2000	2000	11-3-83
Long Tom River at USGS Gage 14170000 (Sec. 33, T.14S., R.5W.)													
(from storage releases only)	370	370	370	370	370	370	370	370	370	370	370	370	6-22-64

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F. Structures or works for the utilization of the waters in accordance with the aforementioned classifications are also declared to be prejudicial to the public interest unless planned, constructed, and operated in conformity with the applicable provisions of ORS 536.310 and any such structures or works are further declared to be prejudicial to the public interest which do not give proper cognizance to the multiple-purpose concept.

Dated May 30, 1985

WATER POLICY REVIEW BOARD

William H. Young

William H. Young, Director
WATER RESOURCES DEPARTMENT

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L-COG
Lane Council of Governments
NORTH PLAZA LEVEL PSB/ 125 EAST EIGHTH AVENUE / EUGENE, OREGON 97401 / TELEPHONE (503) 687-4283

May 10, 1988

014875

Land Management Planning
Willamette National Forest
P.O. Box 10607
Eugene OR 97440

The L-COG Board of Directors met on April 28, 1988 and approved the following comment on the Willamette National Forest Management Plan to be forwarded by the May 16, 1988 comment deadline:

"In order to maintain the viability and consistency of the Lane County economy, the Willamette National Forest Management Plan should (1) maintain maximum allowable timber sales consistent with sustained yield timber harvest practices and good forest management practice and should set a goal at or above the last ten year average Allowable Sale Quantity level of 627 million board feet to provide for adequate timber supply during all phases of fluctuating lumber and wood products markets, and (2) provide for adequate land use allocations to meet the Allowable Sale Quantity, but with sensitivity to environmental impacts on wildlife and air and watershed conditions, recreational opportunities and scenic qualities, (3) to maintain scenic travel corridors of Highways #20, 22 126 and 58 and scenic vistas for destination recreation areas and (4) encourage the continued higher utilization of forest resources such as large mature trees and hardwoods."

L-COG would like to thank the Willamette National Forest Planning staff for their assistance during our review process. Mr. Rolf Anderson made a total of four presentations to L-COG staff, advisory committees and Board of Directors. He provided clear information on a very complicated subject and served as a valuable resource during our decision making process.

In making these comments, the L-COG Board of Directors is serving as the Areawide Clearinghouse for the Lane County area and as an association of Lane County local governmnents.

Bob Bryson, Chair
L-COG Board of Directors

GH:jm/mlmp

BOARD OF COMMISSIONERS
180 NW 5th Street
Corvallis, OR 97330-4777

(503) 757-6800

005675

May 12, 1988

Mr. Michael Kerrick
Forest Supervisor
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick;

The Benton County Board of Commissioners wishes to offer the following comments on the **Proposed Land and Resource Management Plan** for the Willamette National Forest. While the Willamette National Forest is not within the County's jurisdictional boundaries, the Board of Commissioners recognizes the interdependencies in the regional economy and particularly in the timber industry in the southern and central Willamette Valley. Benton County will focus it's comments on these interdependencies and the perceived direct and indirect effects of the preferred alternative on Benton County.

The Forest Service's preferred alternative provides for a phased reduction of the forest's annual Allowable Sale Quantity (ASQ) from 627 Million Board Feet (mmbf) in the early years of plan implementation to 568 mmbf over the 10 to 15 year planning period. The proposed targeted ASQ in the preferred alternative would represent a 21% reduction over the 1987 sale volume of 717 mmbf. Benton County is concerned over the effect of such a dramatic reduction in timber supply from the Willamette when considering a corresponding reduction in the ASQ proposed for the Siuslaw National Forest and the limitations for the harvest of timber on private land.

The proposed Siuslaw Forest Management Plan identifies Benton County mills as being heavily dependent upon timber from the Siuslaw National Forest. The plan references a survey which shows that 43% of 79.3 mmbf consumed by Benton County mills in 1982 came off of the Siuslaw. Although there is no data generally available, it is believed that Benton County mills obtain only a very limited amount of timber off of the Willamette. The County's concern is not with respect to the availability of timber from the Willamette for mills within the County, but with the availability and competitiveness of timber off the Siuslaw and other public and private holdings in the Coast Range.

Historically, Benton County mills have retained competitive control over timber within an economical hauling range. A decline in the supply off the Willamette will likely cause a shift towards the Siuslaw, particularly by Linn County mills. A representative of Willamette Industries indicated that the Forest Service's preferred alternative could cause his company to target the Siuslaw for the purchase of 30-40 mmbf annually to supply their Linn County mills.

Benton County does not believe that this level of competition would be healthy for the Wood Products sector of the County economy. Several of the County's mills are small single owner operations, which have remained competitive or reopened following the recession of the early 1980s. In addition regional trade and service demand generated as an indirect effect of the timber economy in other counties within the regional would also undoubtedly effect the expansion of the Benton County economy. The County believes that some of the 2700 to 2900 jobs predicted to be lost under the proposed alternative could conceivably occur in Benton County.

Benton County contends that the Forest Service has not fully considered the economic effect of the preferred alternative on Counties within the "secondary zone of influence". There has been a noticeable lack of coordination and analysis of the regional effects of multiple proposed forest plans developed by various National Forests. Benton County urges the Willamette and Siuslaw National Forests to undertake a cooperative analysis of the economic effects of plan alternatives on the Central and Southern Willamette Valley prior to further consideration of the respective plans.

Benton County has concerns over the proposed 23% reduction in acreage for general timber production. The County supports Linn County's suggestion that the allocations for scenic quality, roadless areas and dispersed recreation be adjusted to provide an increased harvest level.

The Environmental Impact Statement (EIS) recognizes Benton County in an analysis of socio-economic factors. The EIS uncharacteristically classifies Benton County as "lightly populated", when in fact Benton County ranks as the second most densely populated county in the state outside of the Portland Metro area. If the City of Salem was located in Benton County, as suggested in the EIS, the County would undoubtedly rank number one. The EIS also notes that County residents are recognized as having been "strongly represented among the Forest's recreation users"(EIS p III-231). County residents do enjoy the reasonable proximity to abundant recreational opportunities on the Willamette. The preferred alternative, however, falls short on demonstrating how the reservation of additional roadless area and other non-wilderness area will satisfy projected increases in recreation demand or alleviate overuse of popular areas.

In conclusion, Benton County urges the Willamette Forest Planners to reconsider the alternatives and other plans submitted by agencies and organizations which seek to truly provide for multiple use of this magnificent resource. If you have any questions regarding these comments, please do not hesitate to contact Gary Munsterman at the Benton County Development Department (757-6819).

Sincerely,

Dale D. Schrock
Chairman

cc: U.S. Senator Mark Hatfield
U.S. Senator Bob Packwood
U.S. Representative Peter DeFazio
U.S. Representative Denny Smith
Governor Neil Goldschmidt
Oregon Senator Cliff Trow
Oregon Senator Mae Yih
Oregon Representative Wayne Fisk
Oregon Representative John Schoon
Oregon Representative Tony Van Vliet
Tommy Thompson, Superintendent, Siuslaw National Forest
H. Dale Robinson, Chief U.S. Forest Service
James Torrence, Regional Forester
Linn County Board of Commissioners

DOUGLAS COUNTY

BOARD OF COMMISSIONERS

DOUG ROBERTSON BILL VIAN DORIS WADSWORTH

Courthouse – Roseburg, Oregon 97470 – (503) 440-4201

017381

May 18, 1988

Mike Kerrick, Forest Supervisor
Willamette National Forest
Box 10607
Eugene, OR 97440

Re: Management Plan

Dear Mr. Kerrick:

The Douglas County Board of Commissioners strongly supports the position of the Lane County Commissioners on the Draft Management Plan for the Willamette National Forest.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
OF DOUGLAS COUNTY, OREGON

Doris L. Wadsworth, Chairman

Doug Robertson, Commissioner

Bill Vian, Commissioner

cc: Commissioner Steve Cornacchia

attachment

/dld4
willamet.for

BOARD OF COMMISSIONERS
John Ball
Steve Cornacchia
Ellie Dumdi
Bill Rogers
Gerald Rust, Jr

May 3, 1988
WP bc01541/C

Lane County

Mike Kerrick
Forest Supervisor
Willamette National Forest
Box 10607
Eugene, OR 97440

Re: Response to Management Plan

Dear ~~Mr. Kerrick~~ Mike:

The Lane County Board of Commissioners offers the following response regarding your office's Draft Management Plan for the Willamette National Forest. The Board appreciates the opportunity to review said plan and to comment on its final form. The Board assigned review of the Draft Plan to its Natural Resources Committee and the members of that committee, Commissioner Steve Cornacchia and Commissioner John Ball, have conducted several meetings with user groups associated with different aspects of the forest. The committee has prepared the following response which has been adopted by a majority of the Board for transmittal to your Offices.

Lane County is dramatically affected by the management of the Willamette National Forest. It is home to a majority of the 14,500 direct and indirect employees who make a living from the Forest. It will receive $25 million in national forest receipts in 1988, of which nearly $6 million will be used to fund Lane County's schools. The economic importance of the Forest to Lane County cannot be overstated. The Lane County Board of Commissioners acknowledges that importance and expresses its concern about the future of employment, schools and roads in Lane County in the form of the following response.

Introduction

The Board finds:

1. The Allowable Sale Quantity of the Forest's Preferred Alternative of 568 mmbf cannot be supported.

2. The increase in acreage for Dispersed Recreation at the expense of timber supply cannot be supported.

3. The set aside of 91 Spotted Owl Habitat Areas at the expense of timber supply cannot be supported.

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4. The 67,700 acres of roadless lands retained in an undeveloped condition cannot be supported.

5. The Visual Quality Objectives are unreasonably extensive and cannot be supported.

6. The Forest's use of the decennial averages of timber sale/harvest levels are not indicative of periods of productive timber activity.

7. The Forest has overstated the acreage unsuitable for timber production.

8. All of the offered alternatives continue the polarized argument of plantation type, short-rotation forest versus old-growth forest, and old-growth preservation concepts found generally throughout the preferred alternatives cannot be supported.

The Board recommends:

1. Allowable Sale Quantity. The Board recommends that the Allowable Sale Quantity be set in the range between 650 to 700 mmbf. The 568 mmbf figure of the Preferred Alternative requires an unreasonable shift away from timber production to set asides of questionable economic value. The economic reality of a 568 mmbf ASQ is institutional recession-- a reality that the Board cannot support or endorse. An adequate supply of raw material is absolutely essential to a major small manufacturing component of the County's economy.

   A negative economic impact on Lane County, in the form of reduced employment and reduced timber receipts resulting from the implementation of Alternative J is unacceptable. The economic consulting firm of CH_2M Hill has predicted said economic impact in two scenarios:

   (a) The difference between the 568 mmbf ASQ and potential yield; and
   (b) The difference between probable harvest under the ASQ and the 1985 actual harvest.

   By taking an average of the two scenarios, an unpleasant result becomes apparent:

   - a 25 percent decrease, totalling $4.7 million, in road funds to Lane County.

   - a 25 percent decrease, totalling $1.5 million, in basic school support for Lane County schools.

   - a reduction in the average per student support, $134 per student to $97 per student.

   - a reduction in direct and indirect employment of approximately 3,000 jobs in current employment levels.

The resulting economic figures are unpleasant in that they mirror the economic figures we confronted during the recessionary period of recent years. The Board does not desire to see those figures again, especially as a result of administrative action. Such figures that result from a recession can be accepted; such figures resulting from governmental action cannot. The 568 mmbf ASQ (assuming completely harvested) would set a cap on sales (and harvest) below even 1985 harvest levels. To set an ASQ that does not allow non-recessionary industry production, but that does provide more recreational acreage, is not economically defensible.

2. Dispersed Recreation

The Board recommends against the Preferred Alternative's increased acreage allotment for dispersed recreation. The Forest's increased acreage allotment in many of the alternatives, including the 34,000 acres in Alternative J, appears to be excessive. Any economic trade offs or mitigation of these allotments is marginal and speculative at best. The Board believes that dispersed recreation is compatible with and does occur in areas of harvest activity and the Board does not endorse the removal of productive timberlands to meet the need for additional dispersal recreation. The Board would rather see an emphasis on developed recreational sites--sites that the majority of average vacationing families wish to visit. Primitive recreation has a tremendous playground --the wilderness areas created by Congress--and the need for additional acreage for such activity, outside areas of harvest, has not been adequately demonstrated.

3. SOHA's

The Board recommends that acreage allotments of the plan for Spotted Owl Habitat Areas not be considered as acreage permanently removed from timber harvest acreage until a complete scientific analysis demonstrates the need of such removal for the continued existence of the Spotted Owl. It is suggested that the Forest continue scientific study necessary to establish the connection of the species to old-growth forest eco-systems. If and when the connection is proven, the Forest can then process habitat protection methods through a system of review and analysis. Actual owl habitat within the 800,000 acres of remaining old growth and large mature timber can be monitored and afforded protection in the interim, without permanently removing any acreage from land suitable for timber production.

4. Roadless Land

The Board supports the contention that Congress has mandated specific wilderness areas and has placed all other roadless areas in a multiple-use posture. One-third of the roadless acreage inventory is removed from the timber base to support Dispersed Recreation and to retain old growth under Alternative J. The Board questions the complete removal of these lands from the timber base.

All of the Plan's Alternatives envision some level of roadless area retention. If such retention is to continue under the Forest's management, then the Board suggests that one area receive further review--roadless areas bordering the Waldo Area Wilderness. The recreational value of Waldo Lake and Wilderness to Highway 58 communities is deserving of support. Old-growth hemlock appears in substantial amounts in these roadless areas which lends credence to the contention that timber production values would not be seriously impaired by retention of roadless acreage in these areas. The Board strongly suggests that the Waldo area receive high priority for roadless recreation management.

5. Visual Quality Objectives

The Board recommends that Highways 20, 22, 58 and 126 receive intense management attention for visual quality. Such attention and protection can be shown to have economic value in the tourism and recreation enhancement efforts of Lane County and the State of Oregon. The Board further recommends that other, less frequently-used, roads receive a lower degree of attention and that management efforts be directed at selective timber harvest along said roads. For these roads the Board recommends a multiple-use strategy that does not include allotments of acreage completely removed from the timber base.

6. Decennial Averages of Sale/Harvest

The Board recommends that the Forest discontinue its reliance upon sale and harvest averages of the past decade. Using an average of figures that emanate from a period of extended recession creates an unrealistic economic statement on the productive use of the allowable timber supply. To connect that period's production to an anticipated production level for future decades requires the user of the Forest to accept recessionary levels of production. The creation of a harvest cap mirroring recessionary averages prevents an opportunity for full employment and economic benefit resulting from non-recessionary full production. The Board does not support the prevention of full production under sustained yield practices--a prevention that Alternative J would create.

7. Unsuitable Lands

The Board recommends that the Forest re-evaluate its increased acreage assignment to this category. The evaluation should include current published research in regeneration, the actual timber production occurring, the actual regeneration occurring and the actual harvesting occurring on lands now considered for placement in this category. The entire multiple-use concept cannot be efficiently effected if certain lands are classified in error. The Board is concerned that an "unsuitable" classification today will prevent regeneration innovation tomorrow on lands forever forgotten as productive timberland.

8. Old Growth Forest

The Board recommends that the Forest immediately, upon adoption of its Management Plan and Environmental Impact Statement, begin a review of its management direction regarding the entire Forest in order to address the continuing polarization in the issue of old-growth forest versus short rotation forest. The old-growth issue has become "preserve it all for eternity" versus "cut and use it all today." It appears to the Board that neither position is beneficial to the future of forest, especially 200 to 300 years down the road.

The Board questions the effect upon nutrient return to the soil resulting from rotations of 60 to 90 years. How productive will a forest be 200 years from now during the third and fourth rotations? What is the long-term effect of preventing biomass accumulation that normally occurs in older (150 to 250 years) forests?

The Board questions the effect on genetic diversification resulting from a conversion of the Forest to "short" rotations of 60 to 90 years. Is genetic diversity imperative and, if so, can such a rotation on the Forest lands remaining suitable for timber production ensure its occurrence?

The Board questions whether a complete conversion of the timber base to smaller trees for harvest is in the best long-term interest of the County's economy.

The conventional response to the Board's questions has been to preserve old-growth ecosystems. The wisdom of such a response remains debatable. Short-term benefit of preservation resulting to the particular ecosystem is apparent: biomass accumulation continues the nutrient return and the particular ecosystem's trees grow longer than its transformed neighbors. However, what benefit accrues to the remaining, shorter rotation forest by preserving a particular old-growth ecosystem? How does nutrient return in one preserved area benefit other areas of the forest? How do the genes of one particular area of preserved old-growth, aside from research opportunities, benefit other areas of the forest? If preserved old-growth ecosystems eventually die or transform to other types of ecosystems, what is the long-term benefit of preservation? Is there value in returning nutrient to soil that will never be allowed to produce harvestable timber? Does genetic diversity become merely an axiom supporting a desire to view larger trees? The preservation argument appears to be somewhat nebulous once taken beyond its short-term purpose of saving large trees.

All of the previous questions emanate from the Board's concerns for the short term and long term health of this country's national forests. Concern and vision must never be allowed to become mutually exclusive. Both require an elevation of the issue beyond simplistic arguments that a particular tree should be allowed to grow until it dies or that it should be sent through a sawmill. This belief, and the aforementioned concerns, prompt the Board to suggest that the Forest review its overall management of the Willamette National Forest.

The Board recommends that the Forest immediately upon adoption of its management plan and environmental impact statement, embark upon a course of review that encompasses the viability of extending the rotation of the harvested forest to periods of 95 to 200 years. It is anticipated that such an extension would include the entire forest except for imperative set asides for reasonable visual quality along major tourist routes, existing wilderness, watershed protection and anadromous fishery protection. In other words, except for such set asides the entire forest would be managed as harvestable. All nonexcepted old-growth areas would be returned to the timber base, harvested and regenerated into 95 to 200-year-old ecosystems.

The Board recommends that the review include research regarding the ability of the extended rotation to produce 600 to 800 mmbf annually on a sustained yield basis. The review should also include research on the adaptation of wildlife species to one area of the forest once their habitat has been transformed by harvest in another area of the forest. The Board further recommends that the review include research on the concept of "rest rotation," wherein a specific area is harvested at different ages during continuing rotations (e.g., a cycle of 80 years, then 120 years, then 80 years, then 160 years; or more conservatively, 95-120-95-175).

The Board, admittedly, has little experience or expertise in managing a forest. However, the Board does have extensive experience in controversy; and controversy definitely exists over the Forest's current management of the resource. The Board feels that the Forest, with modification to its Preferred Alternative, can effectively manage the resource while it conducts the recommended review. By virtue of the existence of the polarized controversy it appears that a search for a better way to manage the Forest for present and future generations is necessary. Commitment and effort in the search can lead to results in the forest equal to the other improvements that this nation has brought to itself and the global community in the past 200 years. Our faith in our heritage leads us to believe that an answer and an end to the controversy is attainable.

Sincerely,

Ellie Dumdi

Ellie Dumdi, Chair
Lane County Board of Commissioners

BOARD OF COMMISSIONERS
John Ball
Steve Cornacchia
Ellie Dumdi
Bill Rogers
Gerald Rust, Jr.

014007

Lane County

May 16, 1988
WP bc01561/K

Michael A. Kerrick
Forest Supervisor
Willamette National Forest
Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

I am writing in response to the draft forest plan of the Willamette National Forest. My position is substantially different from that of my colleagues and much of the forest products industry. I find a reluctance to confront reality in much of the thinking of many local governments and the forest products industry. I find that a 600 and to low 700 million board feet per year harvest level is quite unrealistic. We cannot sustain that level of harvest. I also believe that Alternative J, while far more realistic, is also much too responsive to the short-term economics of harvesting old stands of trees. It is important for our region to understand the trade off and be realistic. I find that the City of Salem in choosing Alternative C makes a strong case for preserving watersheds, fisheries and tourism in the North Santiam - the Opal Creek area. These watersheds contain the largest tracts of large, super-old trees in the United States and in the world. This area should remain roadless. I urge an alternative which is substantially below the 500 million board feet. I would prefer to see an alternative in the 350 million board feet range.

It is my considered opinion that we can have a viable timber industry and an old growth forest which protects watersheds, fisheries, wildlife and recreation opportunities. I feel we should invest more in some of the nontraditional areas such as wildlife and fisheries habitat and that the Forest Service should assist our region in making a transition from an old growth-dominated industry to a second-growth and tourism-based industry. The course that we are on now is one of short-term economic thinking.

I urge that the Forest Service adopt a stance toward roadless areas. There should be no more harvesting in roadless areas until the new plans have been approved. This would protect areas such as Waldo in Lane County.

In addition to the Waldo roadless area, I want to see Mt. Fuji, Salmon Creek, Many Prairies, the North Fork of the Middle Fork of the Willamette, the

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Jefferson Roadless Areas and Hardesty Mountain - all protected in an unaltered state.

Sincerely,

Jerry Rust

Jerry Rust
Lane County Commissioner

JR:kko

LINN COUNTY BOARD OF COMMISSIONERS

VERNON SCHROCK, Commissioner
RICHARD STACH, Commissioner
LARRY J. JOHNSON, Commissioner

Linn County Courthouse
P.O. Box 100, Albany, Oregon 97321
(503) 967-3825

WILLIAM L. OFFUTT
Administrative Officer

April 13, 1988

002134

Michael A. Kerrick
Forest Supervisor
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

The Linn County Board of Commissioners has taken the time to review and comment on the proposed plan because of the importance of the National Forest to the Willamette Valley. We find the plan to be thorough and thought provoking, and compliment those who participated in its drafting on an excellent job. The plan must be responsive to various public values and at the same time recognize the diverse ecology of the forest. Throughout the plan, an attempt to strike a balance between market and nonmarket resources is present. The preferred alternative is the result of that effort and the focus of our comments.

It is our recommendation that the Allowable Sale Quantity (ASQ) be increased to at least the level of the average harvest for the last ten years. In order to reach that level, we suggest that scenic quality, roadless lands and dispersed recreation issues be reevaluated and reduced or modified in terms of size and scope. We believe that an increased ASQ can be accomplished without compromising the various resource management programs identified in the plan. By increasing the ASQ, adequate raw materials needed to maintain our primary and historic timber industry will be ensured. An increased ASQ will have a positive impact on the Linn County economy, which in turn will help stabilize families and public institutions.

Timber Supply

In comparing potential yield and actual volumes sold and cut (Figure III-W-2), there was an average cut of about 607 mmbf from 1977 to 1986. In six of the ten years, the proposed ASQ was exceeded with the average cut almost 687 mmbf. The average was almost 488 mmbf during the four years in which the proposed ASQ was not met. If the two highest and lowest cut years are excluded, then the remaining average would be almost 616 mmbf.

We recognize that predicting the future based upon the past is not necessarily reliable. However, in reviewing the previous decade's harvest levels, it is clear that at least 607 mmbf is needed and that in non-recessionary years at least 687 mmbf is needed. In order to sustain current levels of forest industry employment and maintain an opportunity for timber industry growth, the preferred alternative should allow an increased amount of timber production.

The National Forest has an adequate land base to provide for an increased ASQ. Figure III-W-5 identifies 1,005,394 acres as tentatively suitable for timber production. This acreage has a biological potential to yield 743.4 mmbf annually. We are not questioning the need to balance other nonmarket resources, particularly those directed to the management and enhancement of fish and wildlife habitats. However, we believe that allocations for scenic quality, roadless areas and dispersed recreation can be adjusted to provide for an increased harvest level.

Scenic Quality

The preferred alternative claims to emphasize a moderate level of scenic quality within major viewshed corridors. Ten forest viewsheds have been identified which consist of 527,270 acres. Approximately 69,500 acres in scenic management areas have been identified as reduced yield lands (Figure IV-D-19). The Visual Quality Objective (VQO) adopted through the Visual Management System (VMS) is designed to describe the forest landscape and predict the effects of various management actions. We agree that major travel corridors should look like a forest to travelers and other visitors to the Forest. This is particularly applicable to Highways 20, 22, 58 and 126. These highways are traveled by those whose destination is not the forest as well as those who enter the forest for recreation. It is important to leave a favorable impression of the National Forest on all visitors in as much as tourism is Oregon's third largest industry.

However, we question whether this same approach is needed for those whose destination is within the forest, but travel the dead end and little used roads. Does the entire experience need to be natural in appearance in order for the Forest visit to be positive? The lesser traveled and dead end viewsheds should not be managed in the same manner as the viewsheds which occur along the principal highways of the forest. The visual quality objectives of retention and partial retention for the lesser traveled viewsheds should be reevaluated and categorized for modification and maximum modification visual quality objectives. Revising the VQO will provide for an increase of up to 12 mmbf in harvest levels as shown on the attached exhibit which was prepared by the Sweet Home Ranger District.

Roadless Areas

A total of 209,845 acres in 31 inventoried areas have been identified as roadless lands. This area was released for multiple use management under the Oregon Wilderness Act of 1984. It is our opinion that limited or full development is appropriate in most roadless areas. The No Change alternative retains 25 per cent of the acreage in an undeveloped condition. This means that the potential for approximately 52,500 acres of additional wilderness exists if no change occurs. Some of the 31 roadless areas may very well be worthy of future designation as Wilderness. We are not familiar with all of the roadless areas. However, it is our belief that there is a high level of existing Wilderness and that there is not a shortage of National Forest land that can be enjoyed as a wilderness experience.

We do not support the addition of most of the roadless areas because increased set aside land will diminish the timber supply. In instances

where the proposed roadless area is not suited for timber harvest, or is needed to complete a boundary of an existing Wilderness area or where a specialized need is present for wildlife management, roadless status may be appropriate. It is our opinion that multiple management of proposed roadless areas is appropriate in order to permit timber harvest, increase opportunities for recreation and generally increase access to the National Forest. Additionally, roads are valuable as fire breaks and can help reduce the type of damage which occurred in Southern Oregon last year.

Dispersed Recreation

An increased amount of land is being designated for dispersed recreation. Figure III-P-1 shows a total of 131,000 thousand acres of dispersed recreation in the proposed plan compared to 97,000 acres in the 1977 plan. According to Figure III-M-2, dispersed recreation use has recently declined in comparison to an increase in developed recreation use. It seems that if additional recreation opportunities are going to be provided, then they should be in the form of developed sites.

We believe there is an adequate amount of land that is available for primitive and semi-primitive non-motorized activities. The Wilderness, various roadless areas, and other non-wilderness areas provide for 5,059,247 Recreation Visitor Days (RVD). This figure represents the sum of Figures III-M-4 and III-P-7. It is true that the popular areas are overused and that the wilderness experience may not meet the expectations of some users. However, most of the people that use the National Forest are not seeking primitive or semi-primitive experiences. Therefore, efforts should be made to accommodate the largest group of recreationists and not insure that everyone who enters the forest will have easy access to a primitive or semi-primitive experience.

Conclusion

It appears that the preferred alternative provides for increases in Research Natural Areas, Special Interest Areas, Old Growth Groves, Threatened and Endangered Species, Special Habitats, Dispersed Recreation, Scenic Areas, and Developed Recreation over the 1977 Plan. Management areas 1, 2, 3, and 13 remain unchanged. The only decline is in land set aside for General Forest (main area of timber supply), which declines from 1,019,830 acres in the 1977 Plan to 696,745 acres in the 1988 Forest Service preferred alternative.

We recognize that Minimum Management Requirements directs the Forest Service to revise planning for timber harvest. We also understand that it is not always appropriate to emphasize timber harvest at the expense of other forest considerations. However, in the preferred alternative, we believe that all other management areas have been emphasized at the expense of timber supply. This is not necessary or wise in our opinion.

We support multiple use management of the Willamette National Forest and an adequate supply of timber. The preferred alternative emphasizes scenic and roadless values that already exist throughout the Forest and which are specifically established in the Wilderness areas. It also emphasizes primitive and semi-primitive recreation values which will be enjoyed by a minority of the Forest users. In our opinion, most

dispersed recreation is compatible with timber harvest. The most popular recreation activities such as camping, hiking, fishing and hunting are now enjoyed by families and individuals on a variety of land throughout the Forest. More emphasis should be placed on improving access to the Forest and providing adequate developed recreation sites for the benefit of the majority of the Forest users.

A commitment to multiple use whenever possible will maximize the resources of the Willamette National Forest. We support wildlife research and enhancement projects and are not promoting timber harvest as the single purpose of the Forest. What we are promoting, is a land use plan that establishes higher levels of timber supply and addresses the needs of all users of the Forest and its resources.

Sincerely,

LINN COUNTY BOARD OF COMMISSIONERS

Vernon Schrock, Chairman

Richard Stach, Commissioner

Larry Johnson, Commissioner

LINN COUNTY SHERIFF'S OFFICE

ART J. MARTINAK, Sheriff

P.O. Box 100
County Courthouse, Albany, Oregon 97321

Civil Department: 967-3907
Criminal Department: 967-3911

016938

05-13-88
Mike KERRICK
Forest Supervisor
Willamette National Forest
P.O. Box 10607
Eugene, Oregon
97440

RE: Willamette National Forest

Dear Mr. KERRICK;

As the current Sheriff of Linn County, I am extremely interested in the decision that the United States Forest Service makes concerning the Willamette National Forest. A big portion of the Willamette National Forest is in Linn County, of which I have, the duty and responsibility to the citizens of Linn County who are in and about this area for purposes of recreation, employment, and travel.

As the primary law enforcement official of the county, I'm also extremely concerned about funding levels for county government.

After having reviewed the U.S. Forest Service Alternate J, and consulting with friends and Linn County citizens, who are knowledgeable of the Willamette National Forest of Linn County, it is my belief that the citizens of this area would best be served with the current plan or, at the very least, the Willamette Multiple Use alternative outlined by the attached publication.

If I, or my department can be of any further use to you in this matter, please feel free to contact me at any time.

Sincerely,

ART J. MARTINAK
Linn County Sheriff

MEMBER

CC: Copy to file

Marion County
OREGON
BOARD OF COMMISSIONERS

002173

(503) 588-5212

BOARD OF COMMISSIONERS
Randall Franke
Gary Heer
Garry Kanz

ADMINISTRATIVE OFFICER
Ken Roudybush

April 12, 1988

Rolf Anderson
Land Management Planning
Federal Building; 211 E. 7th Street
P.O. Box 10607
Eugene, Oregon 97440

RE: Comments on Willamette National Forest Draft Environmental Impact Statement and Proposed Land and Resource Management Plan

Dear Mr. Anderson:

We have reviewed the above two documents and have the following comments. Approximately 144,000 acres of Willamette National Forest, amounting to 18% of the total Marion County National Forest land area is located within Marion County. All of the National Forest is located within the "Forest" designation on the Marion County Comprehensive Plan and zoned TC (TIMBER CONSERVATION). The primary intent of this Comprehensive Plan and zoning designation is to limit the use of identified forest lands to timber production, farming, watersheds, wildlife habitat, recreation, and other compatible uses.

As we understand it, Alternative J is the Willamette National Forest's preferred alternative for management of the Forest, and this alternative would increase the average level of timber production that the Willamette National Forest has generated over the last ten years. Over the last ten years, the average timber production has been approximately 486 million board feet cut per year. Under Alternative J, the anticipated timber cut would be 568 million board feet per year.

As noted in the Draft Environmental Impact Statement, the aim of Alternative J is to balance the timber, roadless area, old-growth, fish and wildlife, and scenery issues. Timber production under the Alternative will be higher than historic harvest levels, but lower than historic sale levels.

Marion County Courthouse · 100 High Street NE · Salem, Oregon 97301-367(

With regard to timber industry employment, we recognize that throughout Oregon, lumber industry productivity increases have significantly reduced the number of timber industry workers during the last ten years. In 1979 it took 4.5 workers to produce a million board feet; by 1986 it took only 2.8 workers to produce the same amount (Source: State of Oregon Employment Division Labor Market Information, 1987). Thus, even if the same amount of timber were to be harvested in the future as in the past, timber industry employment levels would drop back as part of a general restructuring of Oregon's economy. Our specific comments on the Willamette Forest's planning documents focus on impacts to the Little North Fork Santiam River. The Little North Fork is a tributary stream to the City of Salem's domestic water intake facility at Stayton on the North Santiam, has an anadromous fishery, and is an important recreational and scenic resource for many people in Marion County. In an effort to maintain the very high water quality of the river by preventing any increase in the existing very low amount of phosphorous and nitrogen, the State Environmental Quality Commission has a ban on any discharges to the river. In 1985, the State Legislature designated that portion of the Little North Fork from the confluence of Battle Ax Creek and Opal Creek downstream to the Willamette National Forest boundary as a State Scenic Waterway. As pertains to your two planning documents, our specific concerns have to do with sedimentation and effects on chemical composition of the river resulting from road construction, soil compaction, and soil and fertilizer run-off near tributary streams on the steep slopes on the south side of the river. Another concern is road and timber-cutting impacts near the newly constructed Little North Santiam Trail (#3338) along the river from Elkhorn upstream to Shady Cove.

This is one of the few low elevation trails in the northern part of the Willamette National Forest, and is thus accessible most months of the year.

Both the north and south sides of the Little North Fork canyon have steep slopes with rock outcrops. The DEIS identifies three roadless areas in the canyon, one on the north side and two on the south side. Alternative J allocated Bull of the Woods road-less area (not to be confused with the Bull of the Woods Wilderness further to the east) to a "Dispersed Recreation-Semiprimitive Non-motorized-No Harvest" management allocation. This area is on the north side of the Little North Fork. The DEIS identified 92% of the roadless area as having potential for severe surface erosion, and found the majority of the area cannot be reforested within 5 years. The management allocation for the 6,378 acre road-less area appears appropriate considering existing recreation trails in the area, erosion hazards, and how low amount of potential timber production. The majority of the two roadless areas on the south side of the canyon, however, have been placed in a "General Forest" management allocation by Alternative J. This allocation places major emphasis on timber production. This allocation may be appropriate for some portions of the two roadless areas, however it would not appear appropriate for the majority of the two areas, considering the extensive road construction that will be required for timber harvest, together with potentially severe sedimentation and other water quality impacts. The DEIS identified 73% of the 11,284 acre Opal Creek roadless area as having potential for severe surface erosion, and found 40% of the area as unsuitable or unavailable for timber production. The DEIS identified 80% of the 9,321 acre Elkhorn roadless area as having potential for severe surface erosion, and found 60% of the area would be difficult to regenerate.

In conclusion, we recognize that you have to make difficult choices, and that Alternative J most closely approaches the objective of maximizing overall net public benefits. We request you consider our concerns regarding the Little North Fork drainage, in making your final decision. Water quality on the Marion County portion of the Willamette National Forest currently remains high, and the City of Salem has not had to install a water filtration system to date. For this the Forest Service deserves high praise. Thank you for the opportunity to comment.

BOARD OF COMMISSIONERS

Gary Kane

Gary Hear

Randall Franke

cc: Craig O. Luedeman
Bill Worchester



003843

City of Albany

ALBANY OREGON ALL-AMERICA CITY 1985

April 28, 1988

Michael Kerrick
Forest Supervisor
Willamette National Forest
Box 10607
Eugene, OR 97440

Dear Mr. Kerrick,

The Albany City Council has reviewed the draft Willamette National Forest Management Plan and has some concern about conclusions which have been reached. We feel that further study must be given by the Forest Service before any change in the management of the forest is made.

As city people, it is difficult to envision a forest covering more than one and a half million acres of land. We are more familiar with 5- and 10- or even 20-acre plots of ground that are developed for a variety of uses. We do know about urban uses such as subdivisions, shopping centers, and factories. Perhaps there is an analogy to an industrial factory which relates to the forest. Factories are created for the purpose of producing a product. That is the sole economic reason for the investment and management of a factory.

At the same time, there is a public interest in the proper management of the factory. That interest ranges from the assurance that waters are not polluted by the wastes, to concern about air pollution, and a desire to be sure that the industrial property is well maintained and not unsightly to neighbors or those just passing by.

We want to suggest that the planning for the future of the Willamette National Forest needs to consider that the forest is just a very large and very complex factory. Its principal economic purpose, too, is for the production of a product. In this case, the "factory" produces timber and timber by-products. All other considerations used in planning for the forest must focus upon this principal economic purpose of the Willamette National Forest.

P. O. BOX 490 • ALBANY, OREGON 97321 • (503) 967-4300
AN EQUAL OPPORTUNITY EMPLOYER

With the concept of a timber factory in mind, we think the plan approved for managing our forest ought to be based upon the following principles:

The first priority must be the production of a sustained yield of timber at current levels of production which is about 700 mmbf.

The existing designated wilderness areas must be preserved.

The water quality of rivers, lakes, and streams must be maintained or improved if already derogated.

The minimum requirements of current law must be observed for wildlife and other purposes.

Recreational areas providing for a wide range of forest based activity must be provided.

We believe that the plan should clearly plan not only for multiple use management but specifically for rotational management. By that we mean it is not necessary except for wilderness areas, riparian boundaries, and a few especially sensitive areas to designate lands as forever unavailable for the production of timber.

We want to suggest that consistent with the first priority for a timber "factory," all other areas of the forest should be available for harvest in the future. We don't want that harvest to be indiscriminate. For example, areas of old growth do need to be set aside now for the enjoyment of people engaging in recreation and to protect certain types of wildlife. At the same time some maturing timber needs to be designated as "future old growth." When it reaches that stage of maturity, it should be substituted for the original stand of old growth which should then be harvested.

Likewise, areas designated today for recreation today should be released for harvest when timber in other areas designated for "future recreational use" have matured to a stage where the necessary environment for successful recreation use is created. Through the long-term rotation of land uses and the avoidance of fixed use designations, we believe that the production of our "factory" can be maximized.

We encourage you to re-evaluate the Willamette National Forest Management Plan with the objective of maintaining its current level of productivity with only such minor adjustments as may be necessary to protect the total environment from degradation.

Sincerely,

Tom Holman
Mayor

kg

CITY OF COTTAGE GROVE

002131

400 Main Street, Cottage Grove, Oregon 97424

April 12, 1988

OFFICE OF THE MAYOR

Mike Kerrick, Forest Supervisor
Willamette National Forest
P. O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

By unanimous vote the City Council of Cottage Grove has asked me to respond to the Willamette National Forest Draft Plan.

While we do not support or oppose any specific alternative we are concerned with the impact of any plan on employment opportunities in the Cottage Grove area. The City Council of Cottage Grove would encourage the Willamette National Forest to adopt a management plan allowing for the largest timber harvest possible consistent with sound forest practices.

Sincerely,

Jim Gilroy
Mayor

JG:jh

cc: Doug Stout

May 11, 1988

014653

P.O. Box 276
Creswell, Oregon 97426
503-895-2531

Willamette National Forest
P. O. Box 10607
Eugene, Oregon 97440

RE: Draft EIS Willamette National Forest Plan

Dear Sirs:

On May 9, 1988, the Creswell City Council expressed a concern about the potential negative impact that Preferred Alternative J would have on the local economy of Creswell as well as other parts of our region. They are concerned about the potential loss of jobs, mill closures, loss of Timber Tax Revenue and loss of payroll which in turn reduces the number of property tax payers. This results in higher property taxes for those who were fortunate not to lose their income producing jobs.

The Creswell City Council requests that none of the alternatives listed be accepted. Instead, they support the philosophy of the present management direction for the Willamette National Forest which would generate timber sales at or above the levels of 1987. Our local mill (Bald Knob-Mazama) currently relies 100 percent on public timber sales and would be negatively impacted if lower timber harvests were mandated.

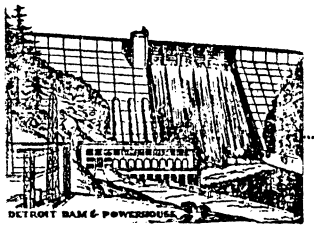
The City Council is also deeply concerned about our environment and believes that a substained yield of 700 million board feet of timber is possible without adversely affecting the fish and wildlife habitat, wilderness areas, and outdoor recreational opportunities. There are many competing uses, all of which can be adequately and safely protected.

Thank you for taking the time to hear the Council's views. You have a tremendously important decision to reach and one we are certain you will make in the best interest of everyone.

Sincerely yours,

Eddie McCluskey
Mayor
City of Creswell

EM:cd
cc - Mark Fleming



005412

City of Detroit

In the Heart of the Scenic North Santiam Canyon

P. O. Box 589
Detroit, Oregon 97342

May 9, 1988

Land Management Planning
Willamette National Forest
Federal Building; 211 E. 7th Street
P.O. Box 10607
Eugene, Oregon 97440

Dear U.S. Forest Service,

Let this letter serve as the City of Detroit's response to your Proposed Forest Plan for the Willamette National Forest.

The Detroit City Council at there regular meeting on April 12, 1988, adopted Resoulution #153 to adopt Willamette National Forest Plan alternative NC (no change).

Thank you for the opportunity to review and comment on the Draft Enviromental Impact Statement and Proposed Forest Plan documents.

Sincerely,
Detroit City Council
Detroit City Council

Dan Park
mayor

DCC/mnk

MAYOR'S OFFICE • 777 PEARL, ROOM 105 • EUGENE, OREGON 97401 • (503) 687-5010
BRIAN OBIE

May 13, 1988

014659

Mike Kerrick, Supervisor
Willamette National Forest Service
211 East 7th Avenue
Eugene OR 97401

Dear Mike:

At their May 9 meeting, members of the Eugene City Council passed a motion to send the following statement to you in response to your request for comment on the proposed "Land and Resource Management Plan."

The City Council of Eugene is supportive of the adoption of a land and resource management plan for the Willamette National Forest.

The Council is very concerned about what may be a lack of balance in the plan. Economic considerations, in general, have not been given proper weighting. The priority order of timber management goals is, in our opinion, out of proper order. From the Council's perspective, it is clear that economic implications should receive a higher priority.

The Council is similarly concerned by the assumptions on which the plan and recommended alternatives are based. An example is the use of a ten year harvest average which likely distorts the economic result of Preferred Alternative J. We recommend you also revisit your data and assumptions on roadless area, unsuitable lands, and set-asides for forest management practices.

The Council finds the reduction in jobs in the Preferred Alternative J to be very disturbing. This plan, as written, will mean significant job losses; the only argument is over exactly how many. The allowable sale of timber should not be less than 670 million board feet per year. This figure is reasonable, justifiable, and responds to sustained yield issues.

The Council understands the complexity of the task of considering a variety of conflicting uses and preparing a plan that provides a balance which serves the public interest. The Council urges the Forest Service to revisit its assumptions and develop modifications that will make the plan more supportive of the role of timber management in assuring the economic vitality of the cities and counties that are dependent on the Willamette Forest.

Mike Kerrick, Supervisor
May 13, 1988
Page 2

Thank you, Mike, for offering the Eugene City Council an opportunity to express these concerns about the proposed plan. If you have any questions, I would be happy to respond.

Sincerely,

Brian B. Obie,
Mayor

BBO:djd/4314S

RESOLUTION NO. 16, SERIES 1988 005670

A RESOLUTION IN SUPPORT OF MODIFICATION OF THE PREFERRED ALTERNATIVE J FOR THE WILLAMETTE NATIONAL FOREST PLAN

WHEREAS, the United States Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

WHEREAS, the culture, social structure and economy of the City of Florence is significantly influenced by the outputs of the Willamette National Forest, and

WHEREAS, the people of the City of Florence are best served by balanced, multiple-use management providing recreational opportunities, clear flowing streams and a dependable timber harvest, and

WHEREAS, the U.S.D.A. Forest Service has analyzed nine (9) alternative management scenarios in its draft management plan, and described their comparative impact on the forest and its output for future decades,

NOW, THEREFORE, BE IT RESOLVED that the Council of the City of Florence requests that in order to maintain the viability and consistency of the economy of Lane County, the Willamette National Forest Management Plan should (1) maintain maximum allowable timber sales consistent with sustained yield timber harvest practices and set a target sales goal which is not less than the current average ten year planned sales level (+/- 630 million board feet per year), to provide for an adequate timber supply during all phases of fluctuating lumber and wood products markets, and (2) provide for adequate land usee allocations to meet the planned sales quantity, but with sensitivity to environmental impacts on wildlife and air and watershed conditions, recreational opportunities and scenic qualities, (3) to maintain scenic travel corridors of Highways #20, #22, #126 and #58 and scenic vistas for destination recreation areas, and (4) encourage the continued research and development for a higher utilization of forest resources.

PASSED BY THE CITY COUNCIL, this 10th day of May, 1988.

APPROVED BY THE MAYOR, this 10th day of May, 1988.

Wilbur Ternyik, MAYOR

P.T. Smith, COUNCILOR

OPPOSED - REFUSED TO SIGN
Jayne Fraese, COUNCILOR

J. Pete Jensen, COUNCILOR

Rob Ward, COUNCILOR

ATTEST: Jon E. Taylor, CITY RECORDER



014101

City of Gates

MARION COUNTY

GATES, OREGON 97346

MAY 13, 1988

MR. M. KERRICK
FEDERAL BUILDING
211 EAST 7TH AVE.
P.O. BOX 10607
EUGENE, OR 97440

Mr. Kerrick in regards to the Willamette National Forest's Draft Land Management Plan. The City of Gates would like to state.

Be it further resolved that the City of Gates desires that the Preferred Alternative place emphasis on support of, community stability and economic development, while also providing for healthy fish and game populations, wilderness, outdoor recreational opportunity and necessary roaded acess to these public lands for their stewardship, public use and enjoyment for future generations.

Sincerely,

Betty Ann Orr

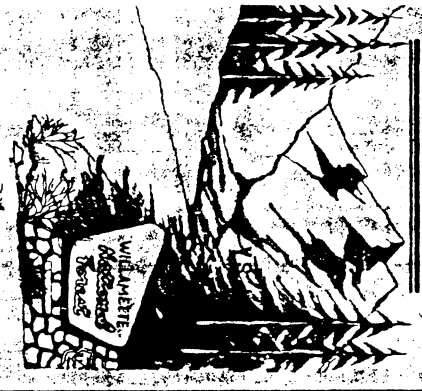
Mayor Betty Ann Orr.

BAO/tq

WILLAMETTE FORESTRY COUNCIL

CHOOSING OUR FUTURE

THE Willamette National Forest Draft Plan



The Willamette Forestry Council asks that you tell the Forest Service to stay with the Present Management Direction which would **keep or increase the current level of all resource outputs**— recreation, wildlife habitat, timber, etc. Write a letter to the Willamette Forest Supervisor with your views. Also, complete this form in response to the four key issues identified by the Forest Service.

Dear Forest Supervisor:

I am interested in the management of the Willamette National Forest because of: [X] Jobs [X] Community Stability [X] Oregon Economy [ ] Other (*Describe*) AND RENEWAL OF A CONTINUING NATURAL RESOURCE

TIMBER HARVEST - The present plan has an annual sustained yield capacity of 347 million board fee I want the annual timber sale program (1987 Sale = 217 Million Board Feet) for (*Check One*)
[X] Remain the same as 1987 [ ] Increase to [ ] Decrease to

WHY? BECAUSE I BELIEVE IT TO BE THE BEST OVERALL PLAN.

OLD GROWTH PRESERVES - The present plan preserves 320,000 acres of old growth timber on the forest. Do you feel this is: (*Check One*) [ ] Enough [X] Too Much [ ] Not Enough

COMMENT: I BELIEVE VERY FEW PEOPLE WILL BE ABLE TO GET TO USE EVEN THIS MUCH OLD GROWTH TIMBER.

WILDLIFE HABITAT - What wildlife concerns do you have (or should the plan address)?

COMMENT: I BELIEVE THE WAY IT IS BEING MANAGED ALREADY IS MORE THAN ADEQUATE FOR WILDLIFE.

(over

ROADLESS AREAS- Should access be provided to roadless areas, outside of existing Wilderness, to enable management for multiple use?
(Check One) ☒ YES ☐ NO

COMMENT: To Allow The Average AMERICAN The Use Of The Federal Forests, Not Just A Wealthy Few

I support the following management plan alternative: (Check One)
☒ Willamette Multiple Use Alternative; Present Management Direction
☐ (Willamette Forestry Council Recommendation)
☐ Alternative J (Forest Service Preferred Alternative) ☐ Another Alternative (Describe Below)

COMMENT: THIS IS A GOOD PLAN FOR EVERYONE AND EVERY THING INVOLVED

COMMENTS MUST BE MADE BY MARCH 21, 1988

RECREATIONAL OPPORTUNITIES
(In the future) I use my use of the forest for:

Hunting/Fishing	X
Camping	X
Firewood Cutting	X
Skiing	X
Off-Road Vehicles	X
Roadless Area Use	X

ALBERT R. ADAMS
NAME
595 DOUGLAS ST / P.O. Box 374
ADDRESS
IDANHA
CITY
OREGON 97350-0374
STATE ZIP
SIGNATURE (Required for Official Response)
MAYOR

FOR IDANHA

IDANHA OR FEB 5 P M 1988 97350

January 9, 1988 Connecticut

Forest Supervisor Mike Kerrick
Willamette National Forest
P.O. Box 10607
Eugene, Oregon 97440

LEBANON CITY HALL
925 MAIN STREET, P.O. BOX 247
LEBANON, OREGON 97355

February 15, 1988

Forest Supervisor Mike Kerrick
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

The Lebanon City Council urges the State of Oregon to recommend to the United State Forest Service to stay with the present management direction.

The proposed Alternative "J" would have an extremely negative impact on the City of Lebanon and Linn County. Among these impacts are:

1) 5-6 medium size sawmills would be forced to close for lack of timber.

2) Approximately 3,000 logging, mill and support and service industry jobs would be permanently lost.

3) Tax payments to county schools and road budgets would be cut by millions of dollars each year. Individual property taxes would be increased to make up the loss.

The present management system is working and is in balance. We must keep or increase the current level of all resource outputs. Increased forest lock-up will not benefit this generation or the next.

Respectfully submitted,

Ronald T. Passmore

Ronald T. Passmore
Mayor of Lebanon

RTP:km

RESPONSE FORM

This form is provided as an aid to assist you in developing your response; its use is optional. Please use whatever format you wish to submit your comments about the Draft EIS and Proposed Forest Plan for the Willamette National Forest.

NAME Rick Shoot Mayor

ADDRESS PO Box 347

(PHONE) 937-2157

CITY Lowell COUNTY Lane STATE Ore ZIP 97452

REPRESENTING: MYSELF_____

ORGANIZATION: City of Lowell

1. YOUR COMMENTS ON THE ISSUES

The issues are the heart of the Alternative development and decisionmaking process for managing the Willamette National Forest. What issues are important to you? How well do you think the Alternatives in the Draft EIS address the issues? Please describe any additional issues you feel need to be addressed.

First, Thanks for the opportunity to respond. thanks also to Rick Scott and gang for their presentation. The City of Lowell is widely divided on this issue. Councilman Tom Hunt is concerned about the economic balance over the years, while Councilperson Gail Thompson is concerned about the quality of stream water and fish habitat. My concern is touching the capacity of Recreation in 50 years or less, while councilman Warren Weathers believes the only good tree is a stump.

6.05099
(ISSUES Continuation Page)

I don't feel qualified to tell you what alternatives are the best. I will leave that in your capable hands

City of Mill City

5674

Located In The Scenic North Santiam Canyon

one 897-2302 *Mill City, Oregon*

A RESOLUTION IN SUPPORT OF THE OREGON MULTIPLE USE ALTERNATIVE FOR THE WILLAMETTE NATIONAL FOREST PLAN

RESOLUTION #263

Whereas, the United States Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

Whereas, the culture, social structure and economy of The City of Mill City is significantly influenced by the outputs of the Willamette National Forest, and

Whereas, the people of Mill City are best served by balanced, multiple-use management providing recreational opportunities, clear flowing streams and a dependable timber harvest, and

Whereas, the U.S.D.A. Forest Service has analyzed nine (9) alternative management scenarios in its draft management plan, and described their comparative impact on the forest and its output for future decades,

Be It Therefore Resolved that, after consideration of the alternatives, the City of Mill City is on record requesting that none of the listed alternatives is acceptable. The City of Mill City requests the U.S. Forest Service choose the Willamette Multiple Use Alternative, submitted by the Willamette Forestry Council. This alternative would retain the philosophy of the present management direction for Willamette National Forest. It would generate timber sales at or above the levels of 1987, and not less than the outputs of the last three years (1985-87).

Be It Further Resolved that the City of Mill City understands that the Willamette Multiple Use Alternative will also provide for healthy fish and game populations, wilderness, outdoor recreational opportunity and necessary roaded access to these public lands for their stewardship, public use and enjoyment for future generations.

DATE January 27, 1988

Larry D. Raley

Larry D. Raley, Mayor

Paula Gundersen

Attest: Paula Gundersen, Recorder

Larry D. Raley, mayor,	abstain
Ron Foster, councilman,	aye
Lloyd Lewin, councilman,	aye
Adolph Brunner, councilman,	aye
Mary Smith, councilwoman,	aye
Stanley Ogden, councilman,	abstain

CITY OF OAKRIDGE

OAKRIDGE, OREGON 97463

782-2258

May 6, 1988

Forest Planner
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Sir:

The City Council of the City of Oakridge approved by a 5 to 0 vote with one abstention at its meeting of May 5, 1988, the following recommendations regarding the USFS preferred management plan for the Willamette National Forest:

1. Our City is a timber based community. Our economy is largely dependent on the timber industry consisting of one major mill complex, several logging companies, numerous employees of various logging, trucking, and reforestation companies, and two Forest Service Ranger Districts. I have a concern that the proposed Allowable Sale Quantity of 568 MMBF is too low and will not be sufficient to sustain our timber industry in Oakridge and Lane County. The Pope & Talbot and Bald Knob operations are now 100% dependent on Forest Service timber. Markets will continue to fluctuate and, I believe, the timber industry will need a larger amount of timber volume to allow for fluctuations in the market over time. I would support an Allowable Sale Quantity of 680 MMBF or greater. I realize that, to attain this sell level, a tradeoff will need to be made for some other resources such as wildlife habitat, roadless areas, middleground and background scenic, and a re-evaluation of unsuited land.

2. A second concern is closely related to timber volume. I have a concern for the number of jobs that potentially could be lost in the Oakridge/Westfir area if Alternative J were implemented. In Oakridge we are trying to create opportunities for more jobs. I don't believe Alternative J would work to our benefit. Jobs would be in jeopardy and possibly lost rather than gained. I recommend that volume levels be increased to 680 MMBF to insure that our timber and service industry jobs are retained.

3. A third concern is for the protection of the scenic corridor along Highway 58. This corridor provides a scenic backdrop for Oakridge. This scenic backdrop is an important characteristic of the landscape surrounding the community. It is important to the attractiveness of the area and creates an appealing setting for tourists and residents

alike. The new theme "Gateway to a Recreation Paradise", is being used to promote tourism for Oakridge. The no-harvest allocation on Larison Ridge facing Oakridge proposed in Alternative J complements our goals. We agree with this allocation but recommend that limited harvests be permitted to control the hazard presented by insect damaged and windblown timber.

4. A fourth concern relates to our community as a retirement area. Our retirement community is growing and the need for close-in recreational opportunities is increasing. We believe the recreational corridors proposed along Salt Creek, Salmon Creek, the Middle Fork, and the North Fork will provide the close-in recreational opportunities needed for our residents as well as for the many tourists and visitors to our area. We hope that these corridors will be retained and managed for their recreational values.

5. A fifth concern relates to the tourism potential of our area. Tourism is a secondary industry for Oakridge and is becoming increasingly more important. One of our goals for strengthening our tourism economy is to establish more developed recreation facilities such as destination resorts. Our hope is that the management plan will allow for the siting and establishment of destination resorts at Hills Creek Reservoir, McCredie Hot Springs, Willamette Pass and any other suitable locations.

These recommendations are the result of my investigations as the mayor of Oakridge and have been amended by the City Council after consideration of public testimony. Thank you for the opportunity to comment on this very important issue and please feel free to contact me if you require clarification of our position.

Sincerely,

Richard W. Culbertson

Richard W. Culbertson
Mayor

RWC:gr

003838

CITY OF SALEM, OREGON
City Hall / 555 Liberty St. S.E.
Zip Code 97301

MAYOR'S OFFICE
Telephone (503) 588-6255

April 21, 1988

Land Management Planning
Willamette National Forest
Federal Building 211 E. 7th Street
P.O. Box 10607
Eugene, OR 97440

Gentlemen:

Enclosed is the City of Salem's response to the "Proposed Land and Resource Management Plan of the Willamette National Forest".

We are recommending Alternative C because we are very concerned with any action that will damage our watershed, the North Santiam River.

The City appreciates very much the information and assistance Dave Alexander gave us in understanding the Forest Service's planning process.

Thank you for allowing us to comment on the Resource Management Plan.

Sincerely,

Susan Miller

Susan H. Miller
Mayor

000014/rd
Enclosure

Salem, Oregon
ALL-AMERICA CITY

NAME: City of Salem, Oregon

ADDRESS: 1410-20th Street S.E. Building #2

PHONE: 588-6063

CITY: Salem

COUNTY: Marion and Polk STATE: OR ZIP: 97302

REPRESENTING City of Salem
ORGANIZATION City of Salem

1. COMMENTS ON THE ISSUE

The City of Salem draws its water from the North Santiam River at Geren Island approximately three miles upstream from the City of Stayton. The watershed draining to this point includes all the drainages of the Little North Fork of the Santiam, as well as all drainages to the North Santiam River upstream in the basin.

The U.S. Forest Service owns approximately 526 square miles or about 78% of the City of Salem's watershed. The City of Salem has a slow sand filtration plant, at the Geren Island facility, to treat the raw river water before sending it by pipeline to Salem and Turner for consumption by its customers. The City of Salem serves approximately 116,000 people in the metropolitan area.

Slow sand filtration, although an old technology, is a recognized and approved method of filtration by the Oregon State Health Division and the Environmental Protection Agency. Bacteria removal occurs by the development of a biological mass that forms on the surface of the sand. This biomass is an extremely sensitive balance of bacteria and other aquatic matter that acts to feed on coliform and other harmful bacteria without allowing them to pass through the filter. Any variations in raw water quality can adversely affect this process and render the filters ineffective.

Since the filters are considered an adequate and approved method of treatment, the City expects the raw water in the North Santiam river to stay at a quality treatable by the slow sand filtration method.

Another aspect that is of great concern is the turbidity levels that occur in the river. The slow sand filters are able to reliably treat water with turbidities no greater than approximately 6 nephelometric turbidity units (NTU's).

The issues which are most important to the City of Salem include:

a. Water quality and quantity - suspended sediments or turbidity are a problem for the City's treatment facilities. As mentioned above, raw water turbidity should be 6 NTU's or less.

b. Riparian management to sustain or improve vegetative buffer zones along streams. Buffer strips in riparian zones should be maintained at minimum depth of 100 feet. Soil erosion is irreversible. It has an immediate effect on raw water quality but it also damages the vegetation cover and so has a long term negative effect.

c. Roadless lands - the protection of remaining roadless lands would allow preservation of natural ecosystems, protection of soil mantles, wildlife habitats and the City of Salem's water supply. Any reduction in roadless areas must be accompanied by mitigation to sustain vegetation and limit erosion impacts.

d. Silvacultural practices - the control of under story vegetation and the effects of aerial and ground spray herbicide and pesticide applications are a major concern as they relate to the City's ability to adequately remove the chemicals used in spraying.

e. Enforcement - quality control to insure that buffer zones, logging activities, and silvacultural practices are maintained in accordance with permit mitigations.

2. COMMENTS ON THE ALTERNATIVES

An adequate range of alternatives are presented in the Draft Environmental Impact Statement (Draft EIS). As indicated in the Draft EIS, there is a negative correlation between higher timber harvest levels, and greater roadless areas, natural habitat, and water quality. Figure S-G-2 shows watershed impact and erosion levels for each alternative. Alternatives J- Departure, I and A show the highest watershed impact and the most erosion. These alternatives also show higher timber harvests and small roadless areas. Alternatives J, F, D, and C show progressive lessening of watershed impact and soil erosion. These alternatives also show lessening of the timber harvest.

The priority for the City of Salem in considering any alternative must be protection and preservation of water quality. The alternative which the City of Salem sees as the best to be accepted is Alternative C. We recommend this alternative as the selected plan. We are willing, however, to consider other alternatives that benefit Salem and that also do not degrade present water quality.

3. DESCRIPTION OF YOUR PROPOSED ALTERNATIVE

No new alternatives are proposed.

4. COMMENTS ON THE PROPOSED FOREST PLAN

On pages IV-13 and IV-14 the issues of mitigation are discussed. These issues are also a major concern to the City of Salem. Some of the items we feel require continual consideration are:

a. Minimum harvest on unstable soils.
b. One end or full suspension logging methods.
c. Use minimum ground skidding. Consider dry season or snow covered logging seasons where ground skidding is planned.
d. Reforest immediately.
e. Re-seed road cuts, fills, and cat trails immediately following harvest.
f. Limit cutting area and young stand area to not more than 30% of the total drainage area.
g. Adequately maintain roads and drainage ways. Close low standard roads during the wet season.
h. Build roads of a higher standard using gravel and only build the roads on stable sites.
i. Provide ample stream side vegetation buffers and protect them from damage by logging and slash fires.

The proposed forest plan thoroughly addresses these issues. We feel that while some protection is given to watersheds, they should be given a much higher consideration.

The impact of logging activities in Salem's watershed, will, in our opinion, remain significant.

The issue of water quality is crucial not only to the City of Salem, but also to fisheries, wildlife habitat, and recreation. Water quality must be made a more important consideration of the management plan.

rd/SR/USFS.ph

014159

SPRINGFIELD

CITY OF SPRINGFIELD
Office of the Mayor/City Manager

May 11, 1988

Mike Kerrick, Forest Supervisor
Willamette National Forest
P. O. Box 10607
Eugene, OR. 97440

RE: Willamette National Forest Management Plan

Dear Mr. Kerrick:

In the past, the Willamette National Forest, under your supervision, has successfully managed the forest by weighing the pros and cons of competing interests.

The future management of the forest will have a substantial economic impact on the City of Springfield. Springfield is the second largest industrial community in the State of Oregon with a majority of its industrial base relying on the wood products industry.

I am very concerned about the Forest's Preferred Alternative of 568 mmbf, and the future impact on our local economy.

The reality of the Preferred Alternative is a recessionary economy created by a governmental action. Reduction in current employment levels and reduced timber receipts to local government will be just two of the impacts felt by such a decision.

Reality and common sense dictates a compromise with regard to all competing interests and issues. Recreation, fish and wildlife, roadless areas, old growth, and visual corridors are all important issues to be considered.

However, the timber harvest in my mind is the overriding issue in management of the Willamette National Forest.

It is my personal opinion that the Preferred Alternative is unreasonable and economic suicide. I would recommend the annual timber sale quantity be a minimum of 700 mmbf.

225 Fifth Street • Springfield, OR 97477 • 503/726-3700

The economic vitality of our metropolitan area will be affected by your future management decisions.

Thank you for the opportunity to provide input on the Willamette National Forest Plan.

Good luck in your endeavor.

Respectfully,

Richard E. Gorman D.C.

Richard E. Gorman, D.C.
Mayor

RG:cl

RESOLUTION NO. 380

A RESOLUTION REGARDING THE UNITED STATES FOREST SERVICE

WILLAMETTE NATIONAL FOREST PLAN

016559

Whereas, the United States Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

Whereas, the culture, social structure and economy of the City of Stayton is significantly influenced by the outputs of the Willamette National Forest, and

Whereas, the people of the City of Stayton are best served by balanced, multiple-use management providing recreational opportunities, clear flowing streams and a dependable timber harvest, and

Whereas, the U. S. D. A. Forest Service has analyzed nine (9) alternative management scenarios in its draft management plan, and described their comparative impact on the forest and its output for future decades,

Now, Therefore, the City of Stayton Does Hereby Resolve:

1. To request that the United States Forest Service modify its multiple-use management plan for the Willamette National Forest to attain the following goals:

   * Maintain Annual Timber Sale Program At or Above 1987 Level (717 Million Board Feet)

   * Preserve an Adequate Land Base to Support Resource Outputs At or Above Present Levels

   * Maintain Current Land Allocation Balance Between Protected Areas and Multiple Use Forest

   * Enhance Recreation Opportunities . . . Access Roads - Developed Recreation Sites - Trails

   * Recognize and Provide Wildlife/Fisheries Habitat Management and Protection

   * Provide Access for Fire Protection and Pest-Disease Control

   * Continue Current Levels of Forest Revenue to Local Government for Schools/Roads

2. To request that the United States Forest Service consider the impacts the management plan will have on community stability and economic development throughout the Detroit District of the Willamette National Forest.

PASSED BY THE COMMON COUNCIL THIS 7th DAY OF MARCH, 1988.

Signed by the Mayor this 7th day of March, 1988.

Wayne Lierman, Mayor

David Kinney,
City Administrator

City of Sublimity 005672

245 Johnson Street
P. O. Box 146
Sublimity, Oregon 97385
(503) 769-5475

RESOLUTION NO. 401

A RESOLUTION IN SUPPORT OF
THE OREGON MULTIPLE USE ALTERNATIVE
FOR THE WILLAMETTE NATIONAL FOREST PLAN

WHEREAS, the United States Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

WHEREAS, the culture, social structure and economy of the City of Sublimity is significantly influenced by the outputs of the Willamette National Forest, and

WHEREAS, the people of the City of Sublimity are best served by balanced, multiple-use management providing recreational opportunities, clear flowing streams, and a dependable timber harvest, and

WHEREAS, the U.S.D.A. Forest Service has analyzed nine (9) alternative management scenarios in its draft management plan, and described their comparative impact on the forest and its output for future decades,

BE IT THEREFORE RESOLVED that, after consideration of the alternatives, the City of Sublimity is on record requesting that none of the listed alternatives is acceptable. The City of Sublimity requests the U. S. Forest Service choose the Willamette Multiple Use Alternative, submitted by the Willamette Forestry Council. This alternative would retain the philosophy of the present management direction for Willamette National Forest. It would generate timber sales at or above the levels of 1987, and not less than the outputs of the last three years (1985-87).

Be it further resolved that the City of Sublimity understands that the Willamette Multiple Use Alternative will also provide for healthy fish and game populations, wilderness, outdoor recreational opportunity and necessary roaded access to these public lands for their stewardship, public use and enjoyment for future generations.

DATED by the City Council the 14TH day of MARCH, 1988.

Mayor

City Recorder

City of Sweet Home

1140 12TH AVEN
SWEET HOME, OREGO
503-367-5128

February 10, 1988

Forest Supervisor
Willamette National Forest
Post Office Box 10607
Eugene, OR 97440

Dear Sir:

First of all, I would like to thank you for the opportunity to comment on the proposed Land and Resource Management Plan. I would certainly hope that the comments made by the people who both use and depend on the forest for their livelihood will be at least part of the basis for your decision.

As elected officials of the City of Sweet Home, the Council is certainly interested in decisions that may affect our community. We think that community stability should be a major consideration. Those of us who live and work in small cities that depend heavily on the forest have much reason to be concerned. We are of the opinion that Alternative J as proposed by the Forest Service would have a serious effect on our community as it would further restrict the amount of timber available to the timber industry. The anticipated loss of jobs and money would have a devastating effect in our area.

May we respectfully point out that the existing plan has 23 percent of the forest set aside for wilderness and an additinal 13 percent set aside for special use that would allow no harvest. This means that over one-third of the forest is already set aside for such uses.

We believe the Forest Service has done a good job in managing the Willamette National Forest with a plan that focuses on multiple use that includes among other things: wilderness areas, old growth preserves, wildlife habitat and an adequate timber supply. Please do not change this to a more restrictive single-use type forest.

We firmly believe that the Management Plan ultimately adopted by the Forest Service should be one that addresses the needs of the people who would be most affected and we strongly urge that community stability be a key issue in determining how the Willamette National Forest should be managed.

Thank you once again for the opportunity to comment on this very important issue.

Very truly yours,

Dave Holley

Dave Holley
Mayor

cc: Sweet Home Ranger Station
City Council

01656

A RESOLUTION IN SUPPORT OF
THE WILLAMETTE MULTIPLE USE ALTERNATIVE
FOR THE WILLAMETTE NATIONAL FOREST PLAN

Whereas, the United States Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

Whereas, 25% of revenue generated from the sale of timber on the Willamette National Forest is returned to countries for the use in road maintenance and schools, and

Whereas, Aumsville Elementary School District 11C is a Marion County School District and will be severly affected by a reduction in Allowable Sale Quantity, and

Whereas, the U.S.D.A. Forest Service has analyzed nine (9) alternative management scenarios in its draft management plan, and described their comparative impact on the forest and its output for future decades,

Be it Therefore Resolved that, after consideration of the alternatives, the Aumsville Elementary School District 11C is on record stating that none of the listed alternatives is acceptable. The Aumsville Elementary School District 11C requests the U.S. Forest Service choose the Willamette Multiple Use Alternative would retain the philosophy of the present management direction for the Willamette National Forest. It would generate timber sales at or above the levels of 1987, and not less than the outputs of the last three years (1985-87).

Be It Further Resolved that the Aumsville Elementary School District 11C understands that the Willamette Multiple Use Alternative will also provide for healthy fish and game populations, wilderness, outdoor recreational opportunity and necessary roaded access to these public lands for their stewardship, public use and enjoyment for future generations.

M Irene Klein
Board Chairman

5/6/88
Date

Aumsville Elementary School
572 N 11th St
Aumsville OR
97325

STANLEY VANDEHEY
~~LEONARD FEBERICO~~
Superintendent
RUTH LONDBERG
Business Manager-Deputy Clerk

BOARD OF DIRECTORS
Dennis Koenig, Chairman
Tom Cook, Vice Chairman
Karen Gauthier
Sandy Dudley
Virginia Honeywell

CASCADE SCHOOL DISTRICT UH NO. 5
10226 MARION ROAD S.E., TURNER, OREGON 97392
Phone 503-743-2137

014883

May 10, 1988

Mike Kerrick, Forest Supervisor
Willamette National Forest
P.O. Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

The Board of Directors of Cascade School District UH#5, Marion County, adopted the enclosed resolution at their regular meeting on May 9, 1988. Please review the resolution and share with appropriate personnel and organizations.

Sincerely,

Stanley Vandehey
Superintendent

cc: Kevin Long, Mill City Enterprise
Ruth Londberg, Deputy Clerk

rd

A RESOLUTION IN SUPPORT OF
THE WILLAMETTE MULTIPLE USE ALTERNATIVE
FOR THE WILLAMETTE NATIONAL FOREST PLAN

Whereas, the United States Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

Whereas, 25% of revenue generated from the sale of timber on the Willamette National Forest is returned to counties for the use in road maintenance and schools, and

Whereas, Cascade Union High School District UH#5 is a Marion County School District and will be severely affected by a reduction in Allowable Sale Quantity, and

Whereas, the U.S.D.A. Forest Service has analyzed nine (9) alternative management scenarios in it's draft management plan, and described their comparative impact on the forest and it's output for future decades,

Be It Therefore Resolved that, after consideration of the alternatives, the Cascade Union High School District UH#5 is on record stating that none of the listed alternatives is acceptable. The Cascade Union High School District UH#5 requests the U.S. Forest Service choose the Willamette Multiple Use Alternative, submitted by the Willamette Forestry Council. This alternative would retain the philosophy of the present management direction for the Willamette National Forest. It would generate timber sales at or above the levels of 1987, and not less than the outputs of the last three years (1985-87).

Be It Further Resolved that the Cascade Union High School District UH#5 understands that the Willamette Multiple Use Alternative will also provide for healthy fish and game populations, wilderness, outdoor recreational opportunity and necessary roaded access to these public lands for their stewardship, public use and enjoyment for future generations.

AGENDA ITEM NO. V-E

ACTION

LINN-BENTON COMMUNITY COLLEGE

COMMITTEE: DAVE SCHMIDT - CHAIR
KARL WISE - MEMBER
BOB HYLAND - MEMBER
GEORGE KURTZ - STAFF

014715

TOPIC: RESOLUTION 12-88: WILLAMETTE FOREST PLAN

GENERAL SUMMARY

It is recommended by the Committee that the Board of Education take action according to the following RESOLUTION:

WHEREAS, the Board of Education of Linn-Benton Community College is responsible for the overall control, operation, and finance of the College, and

WHEREAS, the Board appropriately may comment and/or take official positions on matters that have potential significant consequences on its ability to provide financial support for the College programs, and

WHEREAS, the College District consisting of the majority of Linn and Benton Counties is directly impacted by the activities of the Willamette National Forest, and

WHEREAS, the harvesting of timber on federal forest lands has both direct impact on the College in the form of dollars returned to the counties as offsets against property taxes levied by the College, and indirect impact in the form of employment of district residents and their ability and willingness to support the College, and

RECOMMENDATION TO THE BOARD: THAT THE BOARD OF EDUCATION OF LINN-BENTON COMMUNITY COLLEGE ACCEPT RESOLUTION 12-88.

ACTION TAKEN: Unanimously approved--Yes: Adams, Hyland, Schmidt, Wendland and Wise

DATE: 4/20/88

88-359(G:TIMBERTX.R12)

WHEREAS, reduced timber harvest may result in reductions in district valuation and a shift in tax burden from industry to homeowners, be it therefore

RESOLVED, that the Board of Education of Linn-Benton Community College does support the continued reasonable harvesting of timber on federal forest lands consistent with sustained yield, and be it further

RESOLVED, that no change be allowed from the current, multiple use designations until and unless information yet to be developed should provide reliable data that can be substantiated beyond a reasonable doubt that current land designations and allowable harvest levels will not provide sustained yields, adequate recreation opportunities, appropriate wildlife habitat, and long-term economic and community stability that will allow the Board of Education to continue to provide quality community college services to the residents of Linn and Benton Counties.

DATED, this 20th day of April, 1988.

CLERK OF THE BOARD

CHAIRMAN OF THE BOARD



Mari-Linn School
District No. 29-J
Rt. 2 Box 278
741 Fifth Street
LYONS, OREGON 97358
Telephone 859-2154

01656

A RESOLUTION IN SUPPORT OF THE OREGON MULTIPLE USE ALTERNATIVE FOR THE WILLAMETTE NATIONAL FOREST PLAN

Whereas, the United States Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

Whereas, the culture, social structure and economy of Mari-Linn School District 29j is significantly influenced by the outputs of the Willamette National Forest, and

Whereas, the people of Lyons School District, Mari-Linn District 29J, Linn County, State of Oregon are best served by balanced, multiple-use management providing recreational opportunities, clear flowing streams and a dependable timber harvest, and

Whereas, The U.S.D.A. Forest Service has analyzed nine (9) alternative management scenarios in its draft management plan, and described their comparative impact on the forest and its output for future decades,

Be It Therefore Resolved that, after consideration of the alternatives of the alternatives, the Mari-Linn School District 29J is on record requesting that none of the listed alternatives is acceptable. The Mari-Linn School District 29J of Lyons, Oregon Linn County, requests the U.S. Forest Service choose the Willamette Multiple Use Alternative, submitted by the Willamette Forestry Council. This alternative would retain the philosophy of the present management direction for Willamette National Forest. It would generate timber sales at or above the levels of 1987, and not less than the outputs of the last three years (1985-87).

Be It Further Resolved that the Mari-Linn School District 29J of Lyons, Oregon understands that the Willamette Multiple Use Alternative will also provide for healthy fish and game populations, wilderness, outdoor recreational opportunity and necessary roaded access to these public lands for their stewardship, public use and enjoyment for future generations.

3-10-88
Date

Brenda K. Rott
Chairman of Board of Directors

MARION EDUCATION SERVICE DISTRICT
3400 Portland Road NE
Salem, Oregon 97303

RONALD K. WILKERSON, Supt.
Phone: (503) 588-5330

May 2, 1988

Forest Supervisor Mike Kerrick
Willamette National Forest
PO Box 10607
Eugene, OR 97440

Dear Mr. Kerrick:

At its regular meeting on April 20, 1988, the Board of Marion Education Service District gave consideration to the proposed plans for future uses of the Willamette National Forest. While the Board was not able to come to a consensus regarding any one of the several plans, they did take action regarding the impact of any change that would reduce funding for schools.

I am directed by the Board of Marion Education Service District to communicate to you their concern that whatever proposal is adopted, continue to consider the importance of education and maintaining related funding levels.

Your consideration of the action of the Board is appreciated. Thank you.

Sincerely,

Ronald K. Wilkerson, Executive Secretary
Marion Education Service District Board of Directors

mrt

Stayton Union High School

Marion-Linn County District UH4J
757 West Locust Street Stayton, Oregon, 97383 Phone, 769-2171

016560 APR 2 7 1988

Rec'd. 4/21 5/13

RESOLUTION IN SUPPORT OF THE OREGON MULTIPLE USE ALTERNATIVE FOR THE WILLAMETTE NATIONAL FOREST PLAN

WHEREAS: the United State Congress passed the National Forest Management Planning Act to provide communities in and around every national forest with a congressionally mandated voice in determining how their public forest lands should be managed, and

WHEREAS: the culture, social structure and economy of Stayton Union High School District UH4J, is significantly influenced by the outputs of the Willamette National Forest, and

WHEREAS: the patrons of Stayton Union High School District UH4J, Stayton, Oregon, are best served by balanced, multiple-use management providing recreational opportunities, clear flowing streams and a dependable timber harvest, and

WHEREAS: the U.S.D.A. Forest Service has analyzed nine (9) alternative management scenarios in its draft management plan, and described their comparative impact on the forest and its output for future decades.

Be It Therefore Resolved that, after consideration of the alternative, the Board of Directors of Stayton Union High School District UH4J, is on record requesting that none of the listed alternatives is acceptable. The Board of Directors of Stayton Union High School District UH4J requests that U.S. Forest Service choose the Willamette Multiple Use Alternative, submitted by the Willamette Forestry Council. This alternative would retain the philosophy of the present management direction for Willamette National Forest. It would generate timber sales at or above the levels of 1987, and not less than the outputs of the last three years (1985-87).

Be It Further Resolved that the Board of Directors of Stayton Union High School District UH4J understands that the Willamette Multiple Use Alternative will also provide for healthy fish and game populations, wilderness, outdoor recreational opportunities and necessary roaded access to these public lands for their stewardship, public use and enjoyment for future generations.

Resolution passed unanimously by the Board of Directors, Stayton Union High School District UH4J, Stayton, Oregon, at their regular monthly board meeting held on April 18, 1988.

Susan Bell
Susan Bell, Chairperson
Board of Directors

Your public schools. There's no better place to learn.

EMERALD PEOPLE'S UTILITY DISTRICT

005576

33733 Seavey Loop Road
Eugene, OR 97405
(503) 746-1583

BOARD MEMBERS
Ron Davis
Douglas M. Still
Jim Capps
Dick Eymann
Katherine Schacht

GENERAL MANAGER
Lon Topaz

May 9, 1988

Supervisor
Willamette National Forest
211 E. 7th
Eugene, OR 97401

Dear Sir:

The Board of Directors of Emerald People's Utility District submits the following comments regarding the Willamette National Forest Plan.

Emerald is concerned about both the economical and environmental effects of the various alternatives. The Board has listened carefully to industry and environmental points of view and finds itself "between the experts."

Given the fact that Emerald is not in a position to give expert input it is the desire of the Board of Directors to urge the Forest Service to arrive at an allowable cut consistent with two basic goals:

1. Provide for sufficient remaining timber to allow a sustained yield for the future; and

2. Maintain areas of natural forests for future generations to enjoy while providing for wildlife habitat, erosion control and protection of water shed.

This is a difficult decision to make and we hope that the Forest Service will be able to find that middle ground that will reach the above-stated goals.

Thank you for the opportunity to provide input into what will undoubtedly be a very difficult and controversial decision-making process.

Sincerely,

Lon Topaz
General Manager

ssm