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Environmental Assessment

Presley's Twin Project

**Detroit Ranger District
Willamette National Forest
Linn County, Oregon**

Legal Location: T12S R7E; W.M.

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1. Purpose and Need for Action

1.1 Document Structure ---

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into five parts:

Purpose and Need: The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Comparison of Alternatives, including the Proposed Action: This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the no action alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.

Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Appendices: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record at the Detroit Ranger District Office in Detroit, Oregon.

1.2 Introduction

The project area is in the Detroit Ranger District, Willamette National Forest. The project is in the Upper North Santiam watershed (HUC 1709000501) approximately 14 miles southeast of Detroit, Oregon and about 9 miles north of the junction of State Highways 20 and 22. The legal description of the project area is T12S, R7E, Sections 2-4, 9-11, and 15-16; T11S R7E Sections 32-34 of the Willamette Meridian, Linn County, Oregon.

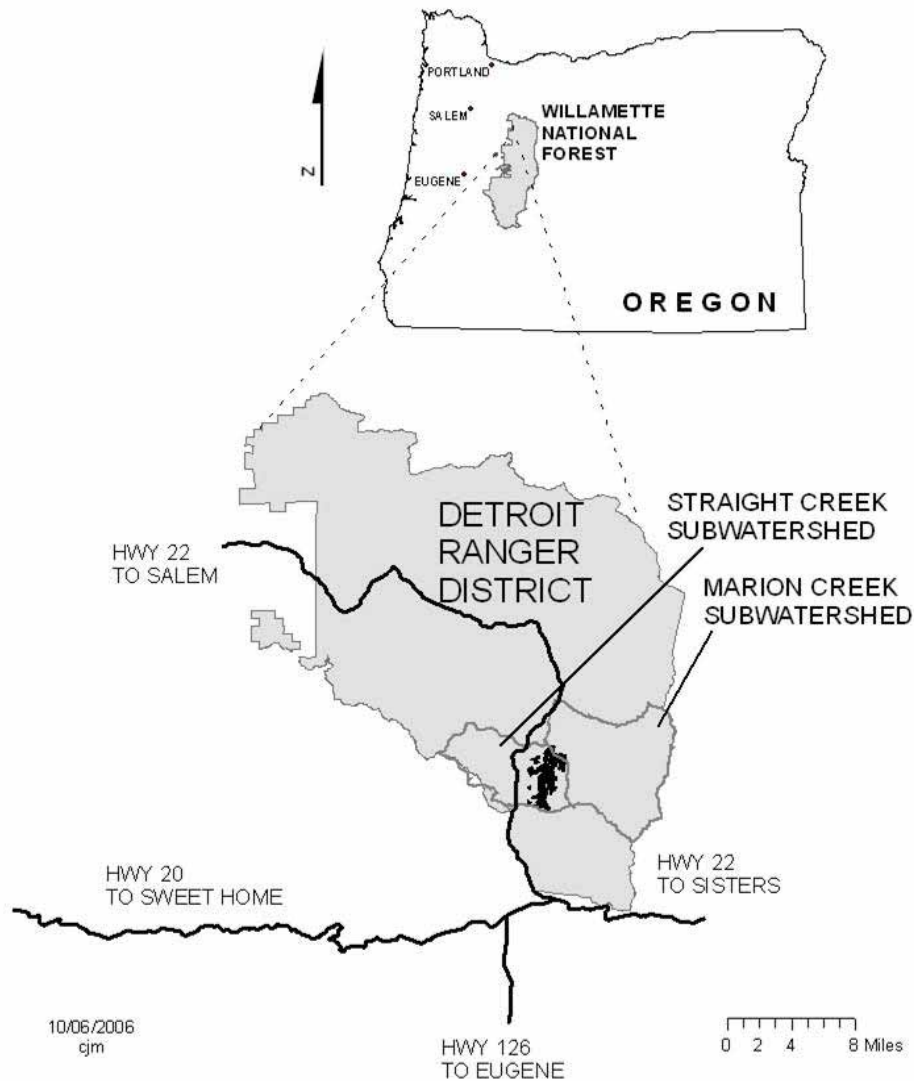


Figure 1-1 Vicinity Map

The project consists of a roaded area east of Highway 22, south of Presley Lake, and in the vicinity of the Twin Meadows area. The project area's western boundary is FS Road #2261-405; the eastern boundary is the Mt Jefferson South - Inventoried Roadless Area and Mt. Jefferson

Wilderness. The north and south boundaries of the project area are delineated along sub-watershed boundaries. The project area is about 6100 acres in size with elevations ranging from 2800 to 4800 feet, the units lie at the upper end of this elevation range between 3800 and 4600 feet.

1.3 Purpose and Need for Action

The purpose of this initiative is to improve growth of the stands and promote forest health, maintain an environmentally sound road network, and to provide a sustainable supply of wood products. There is a need for this action to:

1.3.1 Improve Stand Growth and Promote Forest Health

The project area is characterized by managed, planted, and naturally regenerated stands. All managed stands are less than 50 years old. Naturally regenerated stands are predominated by those in the 100 to 190 year age classes. Except for 25 acres, all proposed harvest units have had a previous harvest entry. These previous harvest entries involved ground based harvesting of selected large, high-value trees. The activities left a patchy stand that is dense and overstocked and also has isolated openings where skid roads or clumps of trees were removed.

In stands proposed for commercial thinning, there is a need to improve forest health by improving stands resiliency to disturbances such as wildfire and disease and to accelerate the establishment of large conifers in riparian reserves to support the development of coarse woody debris in stream channels. In stands proposed for shelterwood overstory removal, there is a need to release young understory trees from competition with remaining shelterwood overstory trees. These needs were identified, in part, by the Upper North Santiam Watershed Assessment.

Stands proposed for thinning have a low resiliency to disturbance events such as insects, disease and wildfire. The watershed has recently experienced substantial defoliation from a Western Spruce Budworm outbreak beginning in 1987 and culminating in 1992. Additional mortality was caused by mountain pine beetle in lodgepole pine and blister rust in white pine (Watershed Analysis, 31). If not treated, competition stress may increase the presence of disturbance agents, resulting in undesirably high rates of mortality. In stands proposed for thinning, there is a need to accelerate establishment of large conifers in riparian reserves and support the development of coarse woody debris in stream channels.

There is a need to limit height and volume growth loss as a resulting from competition of overstory shelterwood trees competing with young understory trees. Field studies conducted in the sale area shows 43% less leader growth in 2005 for Douglas fir understory trees located within 20 feet of an overstory tree when compared with leader growth of understory trees located between 41 and 55 feet from an overstory tree (Enroos, 2005). Eighty six percent of the acres in the final shelterwood removal units fall within 20 feet of an overstory tree. By choosing to leave overstory trees in place, there may be a loss in overall leader growth of 37%. This is based on an average 27 overstory trees per acres (David Leach, personal communication). Understory trees

are growing less flexible as they age; their resiliency to mechanical damage from harvesting the shelterwood overstory will drop substantially as they continue to age.

Proposed thinning and shelterwood overstory removal treatments would help achieve recommended vegetation conditions as proposed in the Upper North Santiam Watershed Analysis and the Willamette Forest Plan. Commercial thinning in riparian reserves would maintain or enhance growth and health of managed stands (Watershed Analysis, 87). Prescribed fire would be used to reduce slash generated as a result of logging activities (Watershed Analysis, 85). Thinning of stagnated stands would provide better growing conditions for remaining trees. Shelterwood overstories would be removed to provide better growing conditions for the developing understory. Shelterwood overstories are no longer needed to ensure seed tree establishment and protection. The understory trees on these shelterwood sites exceed 4.5 feet in height (Forest Plan IV-76) and the overstory is no longer needed to, "assure that [this] area can be adequately restocked within 5 years of the seed cut," (Willamette Forest Plan IV-75).

1.3.2 Maintain Road System at Appropriate Levels

There is a need to maintain all forest roads at their specified maintenance levels and to reduce the potential for erosion while providing safe access. "Maintenance and decommissioning plans should be based on resource protection needs, public safety, long term access needs and economics" (Watershed Analysis, p.79). Maintenance efforts would target Key Forest Roads which, "...should be operated and maintained to standards consistent with [their] maintenance objective. The public would be encouraged to use the system of Key Forest Roads for access into and throughout the forest" (Willamette National Forest Road Analysis, 2003). Several road closure gates and barricades have been vandalized and degraded and are no longer effective barriers to vehicle access. Restoring the integrity of these structures would be part of the project design.

There is a need to mitigate the threat to forest users from danger trees. All roads in the Presley's Twin Project area would be considered for danger tree removal by a certified examiner. Once danger trees are identified, they would be treated in accordance with Forest Service Pacific Northwest Region 6 Policy FSM 7733, R6/PNW supplement number 7730-2005-1, December 12, 2005 or similar current policy if revised before implementation. Danger tree removal equipment would stay on the road's travel surface. Trees in riparian reserves may be cut if they are left in the riparian reserves after felling. All operational restrictions for the sale would also apply to danger tree management activities. Necessary danger tree removal would continue for the foreseeable future life of the road system in the project area.

1.3.3 Provide a Sustainable Supply of Timber Products

The Final Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl recognizes the underlying, “need for forest products from forest ecosystems is the need for a sustainable supply of timber and other forest products that would help maintain the stability of local and regional economies on a predictable and long-term basis,”(NWFP FEIS, 1994). This need was reflected by President Clinton in these words which explain the underlying social need for the final environmental impact statement for the Northwest Forest Plan (Forest Conference Transcripts 1993:252-253):

[W]e must never forget the human and the economic dimensions of these problems. Where sound management policies can preserve the health of forest lands, [timber] sales should go forward.

[T]he plan should produce a predictable and sustainable level of timber sales and non-timber resources that would not degrade or destroy the environment.

To achieve the need for sustainable timber supply the Forest and the Districts determine the capability to provide timber at the Forest, District and project scales. This capability is used to set annual budgets and objectives for timber sales. The 19 MMBF projected for Presley's Twin would contribute to meet the Forest annual objectives for timber harvest.

Direction in the Watershed analysis and the amended Willamette National Forest Plan clearly intends timber management to be focused in matrix lands, like portions of Presley's Twin area. General Forest-Matrix lands have the goal of producing an optimum and sustainable yield of timber, based on growth potential of the land that is comparable with multiple use objectives and meets environmental requirements for soil, water, air and wildlife habitat quality (USDA & USDI, 1994, p. C-39). Furthermore, the Presley's Twin area was listed in the Upper North Santiam Watershed Analysis as, “...one of the best opportunities for timber harvest in the next decade” (p.76). Most of the project area is one of the General-Forest Matrix areas on the Detroit Ranger District where timber harvest could occur and meet Forest Plan Standards and Guidelines for other resources.

1.4 Proposed Action

The District Ranger on the Detroit Ranger District proposes to harvest timber on 1668 acres of the Presley's Twin project area which would yield about 19 million board feet (19 MMBF) of wood products. This proposal, represented in alternative 2 in this EA, would include about 834 acres of final shelterwood (overstory) removal, 52 acres of shelterwood creation, 3 acres of clearcut with reserves, 633 acres commercial thinning to 50 to 70% canopy closure and about 146 acres post and pole harvesting. Timber sales for this project would likely occur over a four year time span beginning in 2008 and expect completion in 2012.

Yarding Systems: Ground based yarding would occur on about 1642 acres and skyline yarding would occur on about 26 acres. Skid roads would be located prior to initiating harvest activities.

Road Maintenance: Roads used for timber haul that do not currently meet forest standards for safety and haul suitability would receive maintenance prior to use. Appropriate road maintenance would be performed on 28.76 miles of system roads which would include paving the last 1.5 miles of the 2261 road. There would be about 4.1 miles of temporary road work which would include about 0.6 miles of new construction and about 3.5 miles of reconstruction of existing roads. Work activities that would be performed on system roads would include brushing, ditch reconditioning, slough removal, slump repair, culvert cleanout and replacement, surfacing, filling in of water dips, and danger tree removal.

Fuel Treatment: Slash generated from harvest activities on landings would be piled and burned. 412 acres of machine grapple piling and burning would occur. In the 26 acres of skyline logging, the tops of trees would be yarded out of the units to the landings to prepare fuels for slash burning at landings. As a post sale activity, 38 acres would be broadcast burned and 41 acres would be under burned.

Riparian Management: Streams will be managed to meet Aquatic Conservation Strategy Objectives. Stream buffers are based on interim widths established in the Northwest Forest Plan. The full riparian reserves in this area are 150-foot slope distance on either side of all streams. Full riparian reserves will be placed on all streams. In final shelterwood removal units no-harvest buffers will extend across the full width of riparian reserves (150'). In commercial thinning units some harvest will be allowed in the outer 100 feet of the riparian reserves. An interior no-harvest buffer of at least 50 feet would be placed on all streams. Harvest in the riparian reserves is allowed under the Aquatic Conservation Strategy Objectives if it benefits riparian reserve objectives (see appendix E for more information).

Riparian reserves are limited to one potential site tree in width because there are no fish bearing streams in the project area. No cut buffers of 50 to 150 feet would be placed along perennial streams. All intermittent streams and ephemeral channels were protected through the maintenance of trees attributing to channel bank stability or by designating 50-150 foot no cut buffers.

1.5 Decision Framework

The Responsible Official for this proposal is the District Ranger of the Detroit Ranger District on the Willamette National Forest. After completion of the EA, there will be a 30-day public comment period. Based on the response to this EA and the analysis disclosed in the EA, the Responsible Official will make a decision and document it in a Decision Notice that will

accompany the final EA. The Responsible Official can decide to select the proposed action, an action alternative that has been considered in detail, or modify an action alternative, or select the no action alternative, and identify what mitigating measures will apply.

The decision regarding which combination of actions to implement will be determined by comparing how each factor of the project purpose and need is met by each alternative and the manner in which each alternative responds to the significant issues raised and public comments received during the analysis. The alternative that provides the best mix of prospective results in regards to the purpose and need, the issues, and public comments will be selected for implementation.

1.6 Tiering and Incorporating by Reference

This EA incorporates by reference the Upper North Santiam Watershed Assessment (USDA, 1995), Willamette National Forest Road Analysis Report (USDA, 2004) Willamette National Forest Land and Resource Management Plan and Record of Decision (USDA, 1990) and Northwest Forest Plan (USDA & USDI, 1994a).

The Upper North Santiam Watershed Assessment provides the responsible official with comprehensive information to aid in land management decisions. The watershed analysis provides descriptions of the reference, historic and existing conditions of the important physical, biological, and social components of the watershed. The study analyzes activities and processes and recommends management activities based upon landscape and ecological objectives.

The Willamette National Forest Road Analysis Report (USDA, 2004) provides recommendations for key roads to be maintained open for traffic and for non-key roads to be considered for closure. The analysis provides information needed to manage a road system that is safe and responsive to public desires, affordable and efficient, has minimal adverse effects on ecological functions and is balanced with available funding.

This EA is tiered to the Willamette National Forest Land and Resource Management Plan (Forest Plan) FEIS and Record of Decision (ROD) dated July 31, 1990, and all subsequent NEPA analysis for amendments, including the April 1994, Northwest Forest Plan (USDA and USDI 1994a), and the accompanying Land and Resource Management Plan, as amended. Only the General Forest (14a) and the Scenic Partial Retention – Foreground (11d) fall inside the boundaries of proposed sale units and would be discussed in this section. Figure 1-2 shows management allocations within unit boundaries.

Table 1-1 Management Allocations

Willamette Forest Plan Management Allocations	Northwest Forest Plan Land Allocations	Acres
10f – Dispersed Recreation – Lakeside Setting	Administratively Withdrawn	217
14a – General Forest – Intensive Timber Management	Matrix	4,799
16b – Late Successional Reserve	Late Successional Reserve	99
11a – Scenic Modification – Middle Ground	Matrix	3
11d – Scenic Partial Retention – Foreground	Matrix	775
11c – Scenic Partial Retention – Middle Ground	Matrix	160
11f – Scenic Retention – Foreground	Matrix	76
13a – Special Use Permit Areas	Administratively Withdrawn	12
15 – Riparian Reserves*	Overlay Existing Allocations	1667
Total Acres		6,141
*Units with riparian reserves are in table 2-7.		

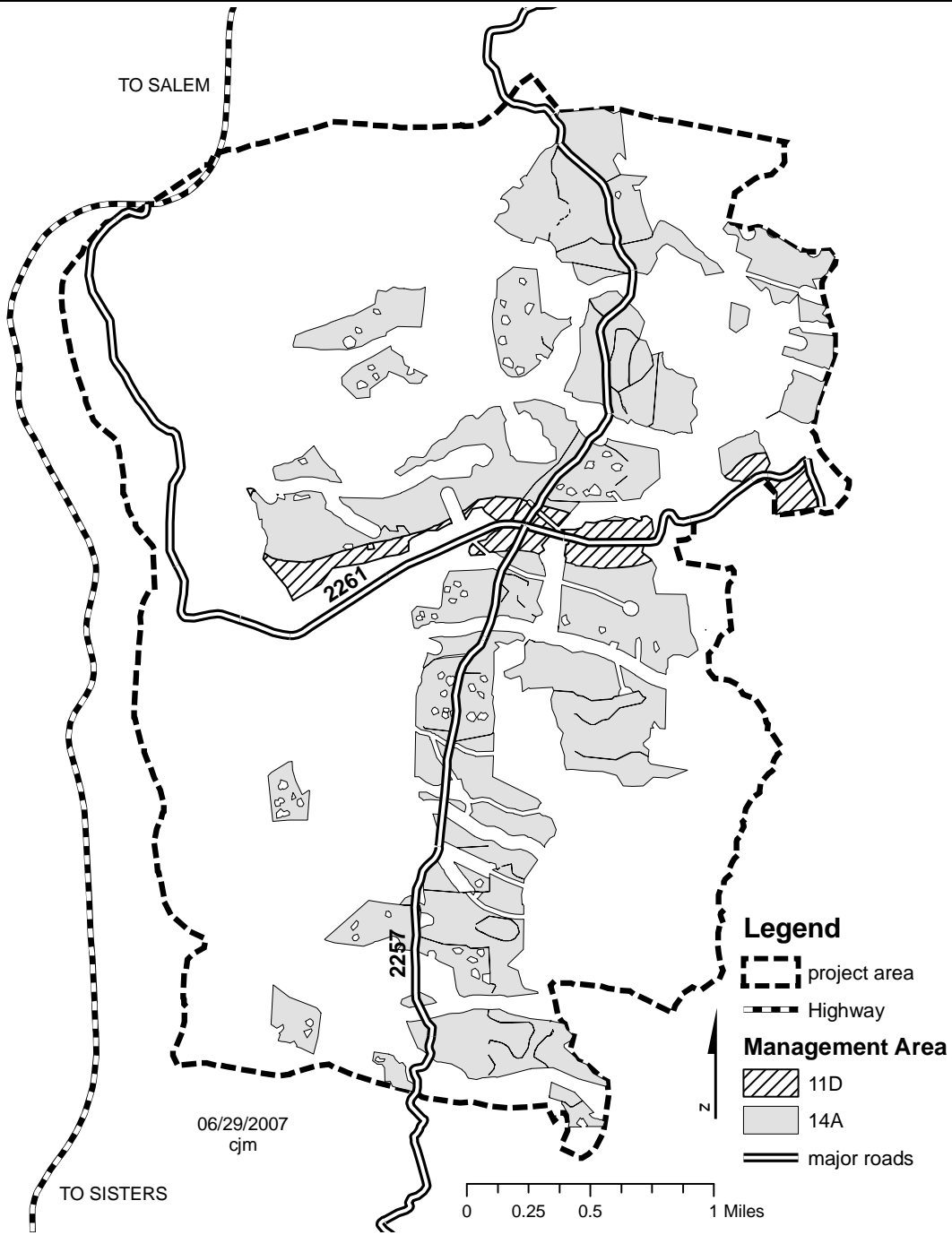


Figure 1-2 Management Allocations of Alternative 2 Proposed Sale Units

General Forest – Intensive Timber Management (14a)

Timber Harvest Units: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 40, 41, 411, 42, 43, 44, 45, 46, 47, 48, 49, 491, 50, 53, 56, 561, 57, 59, 60, 61, 62, 63, 64, 82

The primary goal of this management allocation is to produce an optimum and sustainable yield of timber based on the growth potential of the land that is compatible with multiple use objectives and meets environmental requirements for soil, water and wildlife habitat quality. In addition, this allocation can provide many opportunities for public use and enjoyment. Northwest Forest Plan Matrix objectives include production of timber and other commodities, functions as connectivity between LSRs, and provides habitat for a variety of organisms associated with both late-successional and younger forest. This allocation covers 78% of the project area. All harvest units except 18 and 54 have some portion that falls into management allocation 14a. Direction for silvicultural treatments is outlined in the Forest Wide Standards and Guidelines for Timber Management (FW-176 to FW 183). These guidelines cover the suggested harvest scheduling for removal of timber, suitability for harvest and the timing of harvest to maximize growth rates (mean annual increment).

Scenic – Partial Retention Foreground (11d)

Timber harvest units 15, 16, 161, 18, 54, 55, 80, 81

Scenic Partial Retention Foreground consists of a portion of the viewshed seen along road 2261 which runs from highway 22 to Camp Pioneer. The primary goal of this management allocation is to create and maintain desired visual characteristics of the forest landscape through time and space. Visually sensitive landscapes would be managed for a moderate level of scenic quality. This area would also be managed for other resource goals including maintenance of wildlife habitats, recreation opportunities, watershed protection, and timber production. This allocation covers 13% of the project area. Harvest units 18 and 54 and portions of units 14, 15, 16, 55, 80 and 18 fall into management allocation 11d. Management Area Standards and Guidelines are provided on pages IV 207-209 of LRMP.

Riparian Reserves (15)

Timber harvest units which include riparian reserves listed in Ch. 2, Table 2-7.

Riparian reserves are one of the components of the Aquatic Conservation Strategy outlined in the Northwest Forest Plan ROD (USDA Forest Service, 1994). Riparian reserves, “provide [areas] along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis” (Northwest Forest Plan, p. A-5). They also serve to “improve travel and dispersal corridors for many terrestrial animals and plants,

provide greater connectivity within the watershed,” and serve as connectivity corridors among Late-Successional Reserves (USDA and USDI. 1994, A-5 and B-13).

Riparian reserve widths are based on some multiple of a site-potential tree, or a prescribed slope distance, whichever is greater. In Presley's Twin, Riparian Reserves are 150 feet wide. Reserve widths may be adjusted based on a watershed analysis to meet Aquatic Conservation Strategy (ASC) objectives from the Northwest Forest Plan. The ASC objectives were developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands by maintaining and restoring ecosystem health at watershed and landscape scales. Management activities may occur within riparian reserves in this project only if they maintain and restore the riparian dependent species and their requirements. Portions of proposed units 2, 4, 10, 17, 44, 54, 55, 60, 62, 65, 81, 82 would include thinning in the outer 100 feet of riparian reserves. The inner 50 feet would serve as no-harvest buffers.

Maintenance and reconstruction of existing timber haul roads could occur in this management allocation. The existing transportation system travels through these areas and their reserves. Each alternative affects riparian reserves differently, yet all are permissible under the Standards and Guidelines in the Willamette Forest Plan and the Northwest Forest Plan.

Other Ownership

There is no private land in the project area. Private land that falls in the two sub-watersheds that represent the cumulative effects analysis area is analyzed in section 3.1 of this document.

1.7 Public Involvement

The scoping letter for Presley's Twin was mailed to a number of agencies, organizations and individuals who expressed interest in similar projects in the past; the Confederated Tribes of the Grand Ronde and the Confederated Tribes of the Siletz Indians on July 26, 2005. No comments were received from the tribes. Comments were received from the following organizations, Cascadia Wildlands Project, Oregon Natural Resources Council, Oregon Department of Fish and Wildlife, the Rocky Mountain Elk Foundation and the Back Country Horsemen. Five individuals also submitted comments. All correspondence and full text of letters received are available in the analysis file for Presley's Twin timber sale at the Detroit Ranger District office.

The U.S. Fish and Wildlife Service was consulted and a formal Biological Opinion (Forest Service reference number 1-7-06-F-0179). Their determination was that this project may affect but is not likely to adversely affect spotted owls. The State Historic Preservation Office was consulted and their agency concurred with the findings of “No Effect” to cultural resources for the Presley's Twin timber sale. There would be “No Effect” to fisheries resources as a result of this project. The botanical evaluation determined the project activities would have “No Impact” to proposed, endangered threatened and sensitive species. All consultation documentation is available at the Detroit Ranger District in the Presley's Twin project file.

The proposal has been listed in the Schedule of Proposed Actions (SOPA) or “Forest Focus” since July 2005 with the exception of the period from September through December 2005. The Willamette National Forest publishes the SOPA quarterly on the web and sends the document to over 100 individuals, groups and industry representatives.

As part of the public involvement process, the agency contacted or held meetings with the Boy Scouts of America and the American Forest Resources Council as requested. Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues to be addressed in this assessment.

1.8 Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues describe a dispute or present an unresolved conflict associated with potential environmental effects of the proposed action. Significant issues are used to formulate alternatives, prescribe mitigation measures and focus the analysis of environmental effects. Significant issues are tracked through issue identification (Chapter 1), alternative development and description (Chapter 2), and environmental consequences (Chapter 3). Non-significant issues were identified as those outside the scope of the proposed action; already decided by law, regulation, Forest Plan, or other higher level document; irrelevant to the decision to be made; or conjectural and not supported by scientific or factual evidence.

Significant Issue: Shelterwood Silvicultural System

Measure of Change: Acres of final shelterwood removal

Those opposed to the final shelterwood removal or shelterwood overstory removal in parts of this project were mostly concerned with potential detrimental effects caused by logging activities in mature forests. The effects of harvesting on the ability of these mature forests to provide wildlife habitat, visual enjoyment and forest structure are a concern. Specifically, comments were directed at the lack of snags that could be recruited from a stand after the final shelterwood removal. All prescriptions in shelterwood overstory removal units would abide by management direction that protects wildlife, including spotted owls; stream channels and associated vegetation; visual and scenic resources and regeneration of the young understory.

Significant Issue: Thinning Mature Stands

Measure of Change: Acres of thinning in mature stands

Some comments revealed concerns that thinning in mature forest stands (100-150 years old) may adversely affect forest health and fire behavior. Comments suggested these stands are the most fire resistant in the project area and serve as habitat for many late successional dependent species. Logging these stands might cause adverse effects to the overall fire behavior and habitat quality of the project area.

Significant Issue: Connectivity and Biodiversity

Measure of Change: Acres of unique plants and vegetation conditions which have been delayed from treatment at this time

A significant issue was raised by the interdisciplinary team concerning connectivity and biodiversity. The cumulative effects of concentrated vegetation treatment in this, and other recent projects, and patterns of disturbance created by recent B&B and Puzzle fires, and highway 22 corridor may affect to connectivity and biodiversity by increasing noise levels, human traffic, invasive species and potentially restricting animal movement. Some portions of the project area would provide connectivity and biodiversity if they were not selected as harvest units. See section 2.2.2, Alternative 2 as it responds to the Significant Issues, for more information on the types of stands selected and their unique features.

All alternatives respond to this significant issue through a mitigation measure of deferred harvest in the afore-mentioned corridor.

Non-Significant Issue: Inventoried Roadless Area and Wilderness

Reason for non-significance: already decided by law, regulation or policy

Timber harvest and temporary spur road construction and or road reconstruction located adjacent to the boundaries of the inventoried roadless area and wilderness may affect the resource values and characteristics of these adjacent areas. The recreation experience may decrease during harvest operations due to machinery noise and views of modified, managed forest landscapes. No stands would be harvested in the inventoried roadless area or the wilderness.

For the Presley's Twin project this issue was considered non-significant because the forest operates with Standards and Guidelines for noise exposure and recreation visitor experience as part of the Recreation Opportunity Spectrum in the Willamette Forest Plan. According to the Willamette Forest Plan, stands in management area 11d should achieve the characteristics of a "roaded natural" setting. In roaded natural areas; sights, sounds, and evidence of other users are prevalent and resource modification and utilization practices are apparent, but harmonize with the natural environment (1990 Forest Plan FEIS). Stands in management area 14a have a prescribed standard and guide of roaded modified. These areas should be characterized by a "substantially modified natural environment characterizes area. Sights and sounds of humans are readily evident (1990 Forest Plan FEIS). [The area consists of a] 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" (1990 Forest Plan FEIS). For both management areas the interaction between users is moderate to high on roads, and moderate to low on trails (1990 USDA ROS Primer).

Recreational use along the wilderness border near Camp Pioneer is low and the likelihood of recreation/harvest conflicts is low due to timing and duration of both types of activities. Additionally stands that are at least 10-15 feet tall are considered recovered from a modified state for visual purposes (Willamette Forest Plan, pg IV-209).

The effect of alternatives on recreation and scenic quality are disclosed in section 3.12.

Non-Significant Issue: Big Game

Reason for non-significance: no issues were raised with the proposed action

Stands in the sale area are part of a key big game habitat area. This area is popular with hunters in the fall and supports big game. Several suggestions of ways to improve habitat with monies generated by timber sale activities were brought to light through public comment. No issues with the proposed action were raised. Management suggestions included reduction of meadow encroachment; brush cutting and fertilization in frost pockets; seeding and fertilizing skid trails, landings and closed roads for forage as well as creating movement pathways clear of slash in harvest and pre-commercial harvest units. Many of these suggestions would be incorporated into project design but they do not take issue with the proposed action.

Big game habitat management is dictated by Willamette Forest Plan Standards and Guidelines. All alternatives would meet Forest Plan Standards and Guidelines for moderate emphasis areas and winter range (Willamette Forest Plan, IV 67-70).

Big game related effects are disclosed in section 3.5.1.

Non-Significant Issue: Water Quality & Soil Condition

Reason for non-significance: already decided by law regulation or policy

Concerns were raised about the effects on water quality and soil structure as a result of machine or dozer piling activities. The Detroit Ranger District no longer practices dozer piling (pushing material across the ground to form burn piles). Grapple piling (picking up material and placing it in piles) is now used. "Grapple piling disturbs very little soil and, when properly done, causes almost no soil disturbance and very little compaction" (personal communication, Doug Shank, 2006). There are concerns about the potential increase in the amount of sediment introduced into streams and the compaction of soils, potentially resulting in degradation of water supply to the municipal watersheds of Idanha and Detroit, Oregon. Detroit draws its water from the Breitenbush River, 20 river miles from the proposed project area. Idanha draws its water from the west side of the Santiam River near Rainbow Creek, 15 river miles from the project area. While grapple piling does create a minor amount of compaction, control of pile locations and equipment will minimize the risk to water quality. Additionally, the impact to the municipal watershed would be limited as the sale area lies several miles from the nearest municipal water intake sites.

This issue was not considered significant because proposed activities in the Presley's Twin area are very far from the water intakes of Detroit and Idanha. All action alternatives would meet regulations and laws set forth in the Clean Water Act and the Willamette Forest Plan Standards and Guidelines. All action alternatives include the same mitigation measures such as the creation of riparian reserves and other Best Management Practices aimed at maintaining or reducing detrimental effects to water quality.

Water quality effects are described in section 3.10.6.

Non-Significant Issue: Northern Spotted Owl

Reason for non-significance: outside the scope of the project

Concerns were raised about the combined effects of Sudden Oak Death, competition from Barred Owls, and West Nile Virus. The contributor suggested that these threats might cause existing habitat to be more critical to recovery. Pressures from Sudden Oak Death, Barred Owls and West Nile Virus may be shown to impact spotted owls across their range. However any potential impacts are not measurable at the project level at this time and, thus are outside the scope of this project.

Additionally, many contributors were concerned with impacts to the Critical Habitat Unit (CHU) that falls within the project area. While a portion of the CHU does lie within the project area, none of the units would affect this area. This project does not propose to change or threaten habitat in the Northern Spotted Owl's Critical Habitat Unit (CHU). The only activity that may take place inside the CHU would be the removal of hazard trees on the high traffic 2261 and 2257 roads.

Effects on spotted owls are described in section 3.5.9.

2. Alternatives, Including the Proposed Action

This chapter describes and compares the alternatives considered for the Presley's Twin project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion or cost of helicopter logging versus skidding).

2.1 Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14).

2.1.1 Thinning in Young Managed Plantations

During scoping, the Oregon Natural Resources Council (ONRC - now known as Oregon Wild) suggested that the District consider an alternative that thins young, managed plantations. This alternative was considered but was not analyzed in detail as it does not meet the project's purpose and need to improve growth and vigor in shelterwood plantations, thin stagnated stands in this area, provide a sustainable supply of timber products from this area and reduce fire severity.

There are very few young managed plantations in need of thinning treatment in this area. There are only 121 acres of stands less than 80 years of age that have not been recently harvested within the project area.

2.2 Alternatives Considered in Detail

2.2.1 Alternative 1. No Action

In alternative 1, current management plans would continue to guide activities in the project area. None of the proposed projects would be implemented. The “No Action” alternative serves as a baseline to compare and describe the differences among action alternatives.

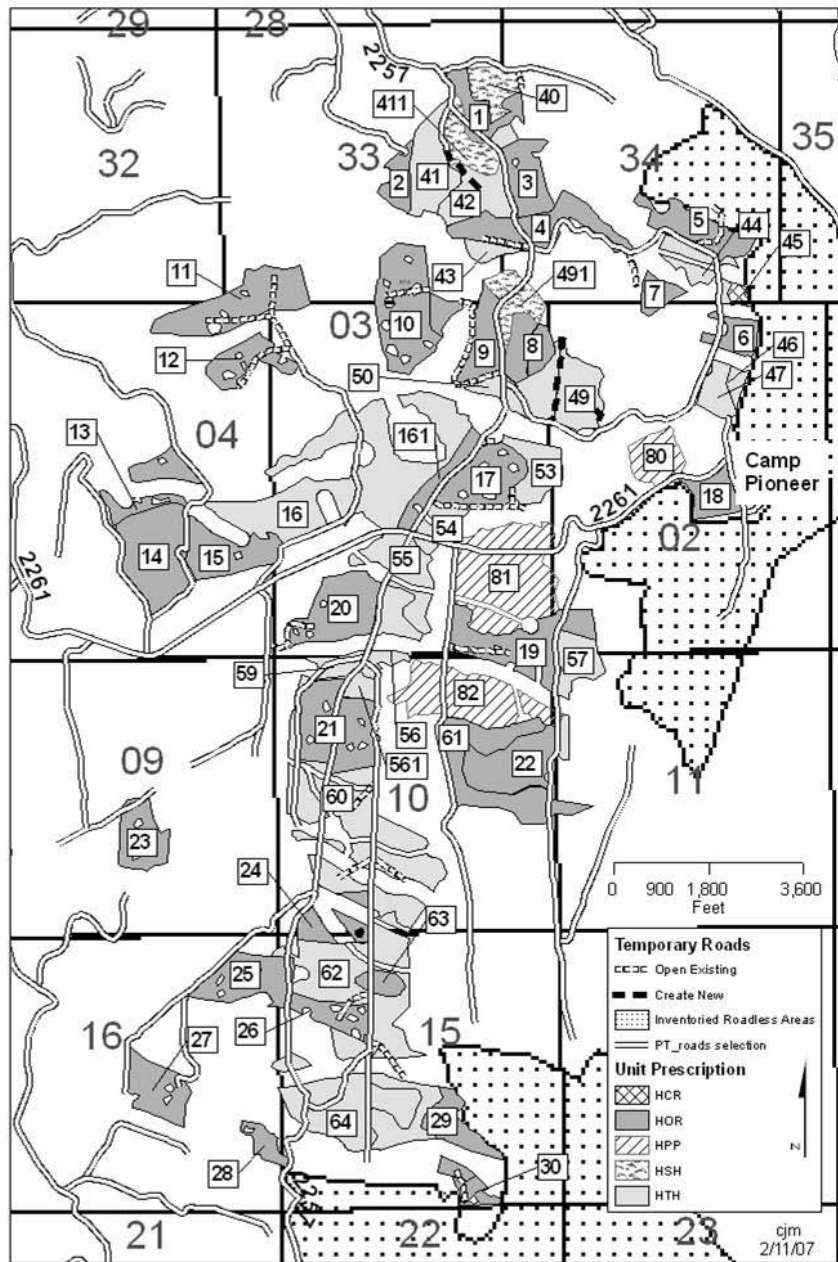
Timber supply objectives would be met with other areas either on the Detroit Ranger District or the Forest. Because there are no harvest units in this alternative, no map is provided. Existing site specific management plans, Standards and Guidelines would continue to be the basis for management of the project area. No funding for survey and control of weeds would be generated. Existing hydrological conditions would persist for 20 to 30 years before conditions began to change. Road maintenance activities would occur according to established patterns of routine maintenance. No fuels would be generated from harvest activity and forested stands would continue on a path of natural succession. Fire suppression policies would continue to dictate fire exclusion from the project area.

2.2.2 Alternative 2. Proposed Action

Alternative 2, the proposed action, would respond to the purpose and need by harvesting timber on 1668 acres of stands for about 19 MMBF of timber products. This alternative is consistent with management direction set forth in the Willamette National Forest Plan. Figure 2-1 shows the units by treatment type. Table 2-1 shows the specific features and types of treatment for each unit in this alternative.

This alternative would:

- Harvest roughly 19MMF on 1668 acres
- Plant 55 acres of regeneration and shelterwood creation units
- Reopen 3.5 miles of temporary spur roads
- Construct of 0.6 miles of new temporary spur roads (roads will be closed after use)
- Maintain and reconstruct 28.76 miles of existing system roads
- Grapple pile and burn 412 acres
- Burn piles at landings
- Broadcast burn 38 acres
- Underburn 41 acres



HCR= Regeneration with Reserves HOR = Shelterwood Overstory Removal
HPP = Post and Pole Harvest HSH= Shelterwood Creation
HTH = Commercial Thinning

Figure 2-1 Alternative 2 Proposed Action

Vegetation

Harvest treatments include 834 acres of final shelterwood overstory removal on shelterwood stands, 52 acres of shelterwood creation, 3 acres of regeneration harvests with reserves, 633 acres of thinning 100-190 year old stands to a canopy closure of about 50%, and 146 acre of post and pole thinning. Final shelterwood removal would harvest remaining overstory trees not needed for wildlife snags, downed woody debris, visual retention objectives, or riparian reserve management objectives. Figure 2-1 shows the units proposed for harvest in this alternative and their silvicultural prescription.

Timber harvest vegetation treatment are determined by the silvicultural prescriptions which include detailed information for each unit and post-harvest treatment are in the Presley's Twin Analysis file at the Detroit Ranger District. A general summary of prescription features is described in this file. Regeneration units would be planted with a mix of Douglas-fir, lodgepole pine, white pine and Englemann's spruce. Commercial thinning would leave an average of 145 square feet of basal area per acre. Prescribed treatments range from 200 square feet of basal area to 85 square feet of basal area with most stands (64%) falling in a range between 120 and 180 square feet.

Fuel Treatment

Fuel treatments that would occur as part of the proposed action for Presley's Twin sale include 493 acres of the following: grapple piling and burning, broadcast burning and under burning. The proposed alternative has the highest acres of fuel treatment of the four alternatives. Prescribed burning for fuel treatment would take place when weather and fuels resemble spring-like conditions which include: fuels greater than three inches in diameter, fuel moistures equal to or greater than 25%, ensuring soil and duff retention levels are maintained at or below duff retention objectives. See table 2-1 for fuel treatments by unit.

Wildlife

Green Tree Retention Areas: The proposed action would prescribe treatments for green tree retention areas (GTRs) snags and downed wood. Green tree retention areas would serve to provide coarse woody debris in matrix management lands Green tree retention areas are scattered, no-harvest patches; 70% of these patches should be 2.5 to 0.5 acres in size with the remainder as individual trees (USDA & DOI, 1994). These retention areas (GTRs) would comprise 15% of each unit or, in units where no mature intact forest exists; portions of adjacent stands would be designated as GTRs. GTRs would be located during presale layout with assistance from the wildlife biologist.

Snag Creation: Standards for snag creation would be met by leaving live green trees in the harvest units during harvest and then topping these trees as necessary 4-5 years after the sale is complete. This would allow natural processes time to creating snags and down wood before they are mechanically created. Low levels of tree mortality are expected in some units where

broadcast burning and under burning are proposed. In the regeneration units leave an average of 3.3 trees per acre for snags. The 3.3 snags per acre would be created on a schedule of 40 years. 1.5 trees per acre would be converted to snags after the sale, 0.8 trees per acre would be converted to snags 20 years after harvest and 1.0 tree per acre would be converted to snags 40 years after harvest. This alternative would meet the Forest Plan Standards and Guidelines for snags.

Downed Woody Debris: Currently, downed wood may exist in pieces greater than 20 feet long and 18 inches in diameter in some units. In addition to any current downed wood, from 1 to 4 trees per acre would be left in all shelterwood creation, final shelterwood removal and regeneration units for future downed wood creation. Pieces would be left as full tree lengths to maximize ecological benefits and should reflect the size and species mix of the stand. Some units have a range of 2-3 or 3-4 trees per acre to be left. The actual number of trees left would depend on the size of trees available and how well they are able to meet 240 linear feet of 18 inches or larger. Larger, taller trees would require fewer individuals to meet size and length requirements. Downed woody material would be created for each unit by leaving green trees during harvest activities and felling them after harvest is completed. See table 2-1 for downed woody debris prescriptions for alternative 2.

Hydrology

BMP: Best Management Practices (BMP) were used in all aspects of this sale to reduce impacts to water quality. Activities which were evaluated and designed to align with best management practices include unit design, stream course protection, landing locations, erosion control, stream crossing design, prescribed fire activities, slope and soil moisture limitations for tractor operations. A full description of BMP can be found in the General Water Quality Best Management Practices Handbook (1988).

Riparian Reserves: Portions of riparian reserves subjected to thinning would benefit from increased diversity and improved stand health. All thinning in riparian reserves is intended to accelerate development of large trees adjacent to streams, provide future large wood input to stream channels. Activities in the riparian reserves would not reduce existing stream shading vegetation or levels of large wood in streams associated with regeneration harvest units. Full riparian reserve areas will function as no-harvest buffers in regeneration units. The inner 33 foot core of perennially wet streams will need to be protected with a no-disturbance buffer to protect Crater Lake tightcoil snail habitat or be surveyed to protocol standards to determine if snails are present.

Engineering

The proposed action would utilize, but not expand, 28.76 miles of the existing forest road system. Temporary road work is not part of the official road system network as these roads have no number and are not intended to be maintained over time. Work required on the road system would be limited to reconstruction or maintenance. Maintenance and reconstruction would

include cutting hardwood trees along roads, felling hazard trees, clearing and grubbing, surface blading, replacing drainage structures, reshaping ditches and placement of aggregate surfacing. Not all roads would need reconstruction or maintenance. Treatments would be applied as necessary to facilitate timber hauling. This alternative would open 3.5 miles of existing temporary logging spurs and create 0.6 miles of new temporary logging spurs. Temporary logging spurs are dirt roads which may need grading, clearing, rock placement or other activities in order to facilitate timber haul.

Alternative 2 as it Responds to Significant Issues

A significant issue of preserving connectivity and biodiversity was raised by the IDT during internal discussions and, as a result, a deferred harvest corridor was created as a mitigation measure to improve connectivity and biodiversity. The corridor of delayed treatment was designed to preserve unique vegetative and hydrologic characteristics. This corridor would serve to preserve unique habitat types and provide dispersal habitat (see section 1.8 for an explanation of the issue).

Stands with unique ground cover which connect wet areas and riparian reserves would be deferred from treatment at this time. These stands were selected through aerial photo interpretation and ground verification to develop a site specific variable width buffer that runs north/south through the project area (see figure 2-4).

Stands selected for inclusion in the corridor would provide botanical, hydrological and wildlife resources lacking in the area or threatened by the project proposal. As a result, selected stands had high amounts of understory huckleberry plants, scatters mesic sites which have a moderate well-balanced supply of moisture, and hydric soils which often develop anaerobic conditions in the upper levels of soil due to high amounts of water. These mesic and hydric sites support unique plant communities with high species richness and include meadows and riparian areas. Many of these acres in the proposed corridor have the least amount of skid roads from previous harvest. Their soils are not as disturbed and compacted as nearby areas and they support surface water features. These stands are currently providing dispersal habitat for northern spotted owls. Many stands that once provided dispersal habitat in the area have been recently destroyed by wildfires or degraded by harvest activities.

Along with the no action and proposed action alternatives, there are two other action alternatives. These alternatives, 3 and 4, added together would be the same as alternative 2, the proposed action. Alternative 3 represents the commercial thinning and post and pole portions of alternative 2 and alternative 4 represents the shelterwood overstory removal, regeneration with reserves and shelterwood creation portions of alternative 2. Figure 2-2 shows alternatives 2.

Table 2-1 Alternative 2 Harvest Unit Summary

Unit	Ac.	Harvest Rx	Temp Road constructed (mi.)	Temp Road Reopen (mi.)	Fuels Treatment	Volume (MBF)	Live Trees for DWD (TPA)	BA/Acre Left Post Thinning
1	18	HOR	0	0.07	GP, L	40	2	
2	11	HOR	0	0	L	70	2-3	
3	23	HOR	0	0		160	2	
4	39	HOR	0	0.18	L	310	2-3	
5	28	HOR	0	0.15	L	140	3-4	
6	12	HOR	0	0	L	150	2-3	
7	9	HOR	0	0.13	L	50	3-4	
8*	20	HOR	0	0	L	280	2	
9	28	HOR	0	0.53		140	2-3	
10	48	HOR	0	0.17	L	270	3-4	
11	45	HOR	0	0.52	L	230	2-3	
12	19	HOR	0	0.26	L	90	2-3	
13	21	HOR	0	0	L	190	2	
14	52	HOR	0	0	L	600	2	
15	28	HOR	0	0	L	280	2-3	
16	124	HTH	0	0		370	1	37 ¹
161	16	HOR	0	0		50	2	
17	30	HOR	0	0	L	140	2-3	
18	19	HOR	0	0	L	80	2-3	
19	45	HOR	0	0.23	L	570	2	
20	37	HOR	0	0.25	L	540	2	
21	49	HOR	0	0	L	650	2	
22	36	HOR	0	0	L	550	3	
23	22	HOR	0	0	L	290	2	
24	14	HOR	0	0	L	220	2-3	
25	31	HOR	0	0	L	410	2-3	

¹ Prescriptions for these units were based more on removing mistletoe infected and suppressed trees and thinning existing clumps of timber. They were not based on basal area as a target treatment level.

Unit	Ac.	Harvest Rx	Temp Road constructed (mi.)	Temp Road Reopen (mi.)	Fuels Treatment	Volume (MBF)	Live Trees for DWD (TPA)	BA/Acre Left Post Thinning
26	15	HOR	0	0.16	L	340	2	
27	25	HOR	0	0	L	230	2	
28	8	HOR	0	0	L	70	2-3	
29	23	HOR	0	0	L	140	3-4	
30	6	HOR	0	0	L		2-3	
40	15	HSH	0	0	GP, L	250	3-4	
411	19	HSH	0	0	BCB	380	2-3	spacing ²
41	30	HTH	0	0	GP, L	600	1	92 ¹
42	29	HTH	0.2	0	GP, L	610	1	190
43	6	HTH	0	0		50	1	180
44	15	HTH	0	0	GP, L	390	1	160
45	3	HCR	0	0	BCB, L	80	3-4	
46	4	HTH	0	0	GP, L	110	1	100
47	12	HTH	0	0	GP	320	1	160
49*	41	HTH	0	0	GP	1000	1	180
491	18	HSH	0.4	0.40	BCB, L	440	3-4	50
50	10	HTH	0	0	GP, L	230	1	120
53	20	HTH	0	0.10	L	490	1	120
54	12	HTH	0	0	GP, L	290	1	120
55	29	HTH	0	0	UB, L	640	1	100
56	6	HTH	0	0	UB, L	100	1	120
561	6	HTH	0	0	UB	90	1	26 ¹
57	21	HTH	0	0	GP, L	500	1	140
59	24	HTH	0	0	GP, L	720	1	200
60	92	HTH	0	0.42	GP, L	1160	1	170
61	47	HOR	0	0		730	2-3	
62	88	HTH	0	0.18	GP, L	1350	1	170
63	8	HOR	0	0	L	100	2	
64	64	HTH	0	0	L	420	1	85
80	20	HPP	0	0		0	0	
81	75	HPP	0	0		0	0	
82	51	HPP	0	0		0	0	

² A 40 foot spacing of the largest trees available would be left for frost protection.

Unit	Ac.	Harvest Rx	Temp Road constructed (mi.)	Temp Road Reopen (mi.)	Fuels Treatment	Volume (MBF)	Live Trees for DWD (TPA)	BA/Acre Left Post Thinning
All	1668		0.6	3.5	NA	18770		

HOR – Shelterwood overstory removal

HSH – Shelterwood Harvest

GP – Grapple Pile

HTH – Commercial Thin

BCB – Broadcast Burn

HPP – Harvest Post and Pole

UB – Under Burn

MBF – Thousand Board Feet

L – Burning of Landings

DWD – Downed Woody Debris

TPA – Trees per Acre

*These units would be partially skyline harvested. All other units would be ground based yarded
More detailed information regarding unit prescriptions is available at the Detroit Ranger District from Christy McDevitt (503-854-4228) or Rich Hatfield (503-854-4219).

2.2.3 Alternative 3. Commercial Thinning

Alternative 3 is a subset of actions from alternative 2. Alternative 3 represents only the commercial and post and pole thinning treatments portions of alternative 2. The major difference between alternatives 2 and 3 is no activity would occur in stands proposed for shelterwood removal, shelterwood creation or regeneration harvest units. Alternative 3, commercial thinning, would respond to the purpose and need by harvesting timber on 779 acres of stands. This alternative is consistent with management direction set forth in the Willamette National Forest Plan. Figure 2-3 shows the units by treatment type. Table 2-2 shows the specific features and types of treatment for each unit in this alternative.

This alternative would:

- Harvest roughly 10 MMBF on 779 acres
- Reopen 0.5 miles of temporary spur roads
- Construct of 0.2 miles of new temporary spur roads (roads will be closed after use)
- Maintain and reconstruct 28.76 miles of existing system roads,
- Grapple pile and burn 291 acres
- Burn piles at landings
- Under burn 41 acres

Vegetation

Harvest treatments include 633 acres of commercial thinning of 100-190 year old stands to a canopy closure of about 50%. Figure 2-3 shows the units proposed for harvest in this alternative and their silvicultural prescription.

Timber harvest vegetation treatment are determined by the silvicultural prescriptions which include detailed information for each unit and post-harvest treatment are in the Presley's Twin Analysis file at the Detroit Ranger District. A general summary of prescription features is described in this file. Commercial thinning would leave an average of 145 square feet of basal

area per acre. Prescribed treatments range from 200 square feet of basal area to 85 square feet of basal area with most stands (64%) falling in a range between 120 and 180 square feet.

Portions of riparian reserves would benefit from treatment to increase diversity and stand health. Fuel treatments similar to those described in alternative 2 would occur on 352 acres (35% less than in alternative 2) in the project area. Work on the road system would be similar to the work proposed in alternative 2. There would be no green tree retention areas as those treatments are associated with the shelterwood overstory removal units; which are not included in this alternative. Figure 2-3 shows treatment type by units for alternative 3. Table 2-2 shows logging system, harvest prescriptions, roads and fuels treatments and downed woody debris prescriptions by unit for alternative 3.

Fuel Treatment

Fuel treatments that would occur as part of the proposed action for Presley's Twin sale include 332 acres of the following: grapple piling and burning, and under burning. Prescribed burning for fuel treatment would take place when weather and fuels resemble spring-like conditions which include: fuels greater than three inches in diameter, fuel moistures equal to or greater than 25%, ensuring soil and duff retention levels are maintained at or below duff retention objectives. Pruning would occur along a 66-foot buffer in sale units on both sides of the 2257 and 2261 roads. Pruning would not occur within 10 meters of perennially wet areas to protect habitat for the Crater Lake Tightcoil (*pristilloma*). See table 2-1 for fuel treatments by unit.

Wildlife

Snag Creation: Standards for snag creation would be met by leaving live green trees in the harvest units during harvest and then topping these trees as necessary 4-5 years after the sale is complete. This would allow natural processes time to creating snags and down wood before they are mechanically created. Low levels of tree mortality are expected in some units where under burning is proposed. This alternative would meet the Forest Plan Standards and Guidelines for snags.

Downed Woody Debris: In addition to any current downed wood, from 1 to 4 trees per acre would be left in all units for future downed wood creation. Pieces would be left as full tree lengths to maximize ecological benefits and should reflect the size and species mix of the stand. Some downed woody debris prescriptions specify a range of trees per acre to be left. The actual number of trees left would depend on the size of trees available and how well they achieve the required specification of 240 linear feet of 18 inches or larger. Larger, taller trees would require fewer individuals to meet size and length requirements. Downed woody material would be created for each unit by leaving green trees during harvest activities and felling them after harvest is completed. See table 2-2 for downed woody debris prescriptions for alternative 3.

Hydrology

BMPs: Best Management Practices (BMPs) were used in all aspects of this sale to reduce impacts to water quality. Activities which were evaluated and designed to align with best management practices include unit design, stream course protection, landing locations, erosion control, stream crossing design, prescribed fire activities, slope and soil moisture limitations for tractor operations. A full description of BMPs can be found in the General Water Quality Best Management Practices Handbook (1988).

Riparian Reserves: Portions of riparian reserves subjected to thinning would benefit from increased diversity and improved stand health. All thinning in riparian reserves is intended to accelerate development of large trees adjacent to streams, provide future large wood input to stream channels. Activities in the riparian reserves would not reduce existing stream shading vegetation or levels of large wood in streams associated with regeneration harvest units. Full riparian reserve areas will function as no cut buffers in regeneration units.

Engineering

The proposed action would utilize, but not expand, 19.84 miles of the existing forest road system. Temporary road work is not part of the official road system network as these roads have no number and are not intended to be maintained over time. Work required on the road system would be limited to reconstruction or maintenance. Maintenance and reconstruction would include cutting hardwood trees along roads, felling hazard trees, clearing and grubbing, surface blading, replacing drainage structures, reshaping ditches and placement of aggregate surfacing. Not all roads would need reconstruction or maintenance. Treatments would be applied as necessary to facilitate timber hauling.

This alternative would open 0.5 miles of existing temporary logging spurs and create 0.2 miles of new temporary logging spurs. Temporary logging spurs are dirt roads which may need grading, clearing, rock placement or other activities in order to facilitate timber haul.

Alternative 3 as it responds to the Significant Issues

Alternative 3 would respond to the significant issue of shelterwood harvesting by not harvesting the 889 acres of shelterwood overstory. The desired stand condition that represents a healthy and vigorous forest, in this case, is the continued unimpeded development of growing understorey stands at rates that are consistent with forest plan direction. There is not an alternative silvicultural treatment to shelterwood overstorey removal that would achieve the desired stand conditions of freeing the understorey to grow without impediment from the remaining shelterwood overstorey. For these reasons, there would be no alternative harvest method suggested for these stands and this portion of the proposed action is dropped in alternative 3.

Alternative 3 responds to the significant issue of connectivity and biodiversity by also including the deferred-harvest corridor. See the section titled Alternative 2 as it responds to the Significant Issues for a description of stands selected for inclusion in the corridor.

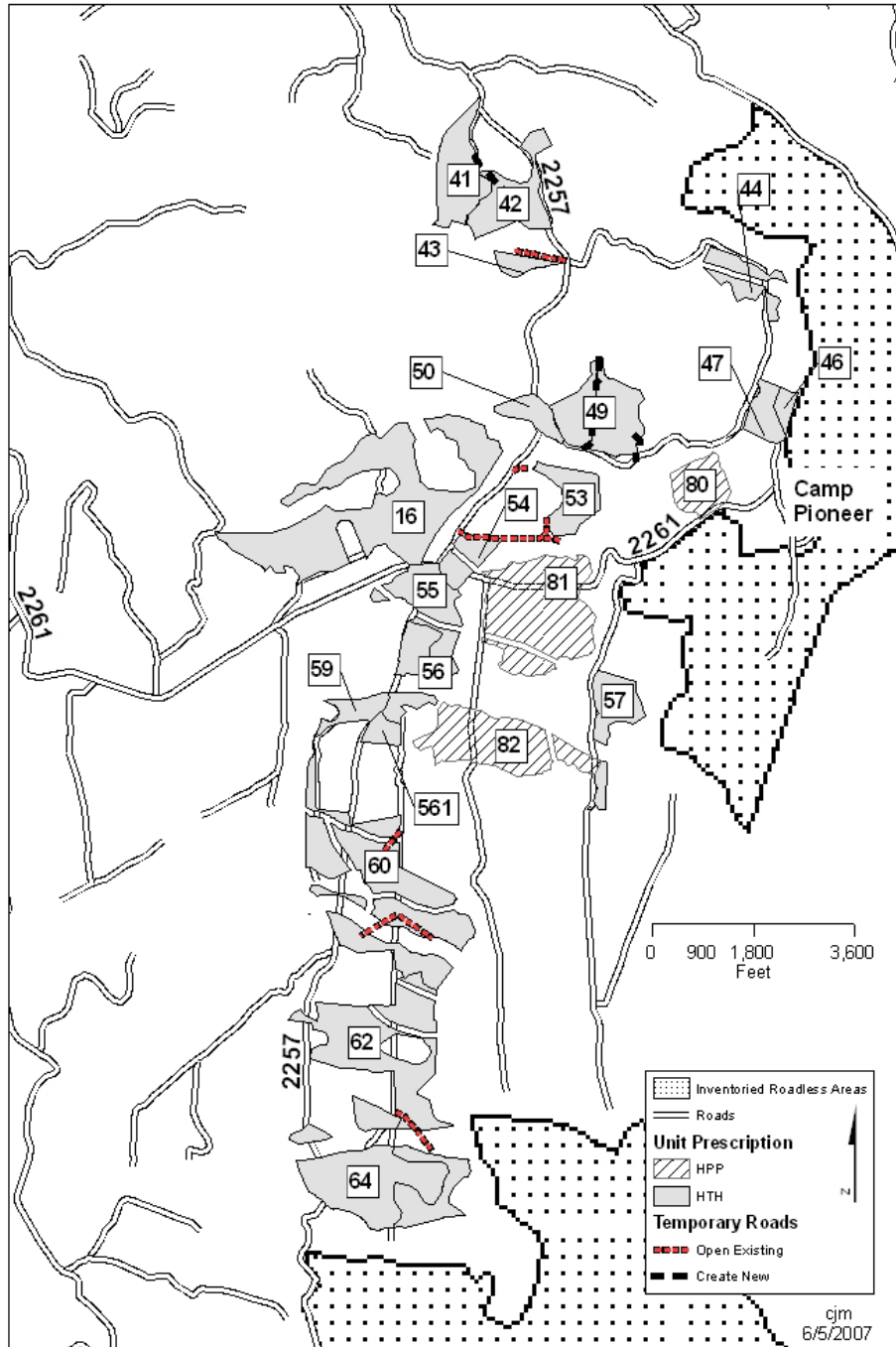


Figure 2-2 Alternative 3

Table 2-2 Alternative 3 Units Summary

Unit	Acres	Harvest Rx	Temp Road Constr. (mi.)	Temp Road Reopen (mi.)	Fuels Treatment	Volume (MBF)	Live Trees Left for DWD (TPA)	BA/Acre Left Post Thinning
16	124	HTH	0	0		370	1	37 ³
41	30	HTH	0	0	GP, L	600	1	92 ³
42	29	HTH	0.2	0	GP, L	610	1	190
43	6	HTH	0	0		50	1	180
44	15	HTH	0	0	GP, L	390	1	160
46	4	HTH	0	0	GP, L	110	1	100
47	12	HTH	0	0	GP	320	1	160
49*	41	HTH	0	0	GP	1000	1	180
50	10	HTH	0	0	GP, L	230	1	120
53	20	HTH	0	0.10	L	490	1	120
54	12	HTH	0	0	GP, L	290	1	120
55	29	HTH	0	0	UB, L	640	1	100
56	6	HTH	0	0	UB, L	100	1	120
561	6	HTH	0	0	UB	90	1	26 ³
57	21	HTH	0	0	GP, L	500	1	140
59	24	HTH	0	0	GP, L	720	1	200
60	92	HTH	0	0.42	GP, L	1160	1	170
62	88	HTH	0	0.18	L	1350	1	170
64	64	HTH	0	0	L	420	1	85
80	20	HPP	0	0		0	0	
81	75	HPP	0	0		0	0	
82	51	HPP	0	0		0	0	
All	779		0.5	0.2	NA	9500		

HOR – Shelterwood overstory removal

GP – Grapple Pile

BCB – Broadcast Burn

UB – Under Burn

L – Burning of Landings

TPA – Trees per Acre

MBF—Thousand Board Feet

HTH – Commercial Thinning

HPP—Harvest Post and Pole

HSH – Shelterwood Creation Harvest

HCR—Regeneration Cut with Reserves

DWD – Downed Woody Debris

* Units would be partially skyline harvested. All other units would be ground based yarded

2.2.4. Alternative 4. Shelterwood Removal

Alternative 4, the proposed action, would respond to the purpose and need by harvesting timber on 889 acres of stands for about 9 MMBF of timber products. Alternative 4 is a subset of actions from alternative 2. Alternative 4 represents only the shelterwood overstory removal, regeneration with reserves and shelterwood creation portions of alternative 2. The major difference between alternatives 2 and 4 is no activity would occur in stands proposed for commercial thinning or post and pole harvest units. This alternative is consistent with management direction set forth in the Willamette National Forest Plan. Figure 2-3 shows the units by treatment type. Table 2-3 shows the specific features and types of treatment for each unit in this alternative. This alternative would:

- Harvest roughly 9MMF on 889 acres
- Plant 55 acres of regeneration and shelterwood creation units
- Reopen 3.0 miles of temporary spur roads
- Construct 0.4 miles of new temporary spur roads (roads will be closed after use)
- Maintain and reconstruct 28.76 miles of existing system roads,
- Grapple pile and burn 122 acres
- Burn piles at landings
- Broadcast burn 38 acres

Vegetation

Harvest treatments include 834 acres of final shelterwood overstory removal on shelterwood stands, 52 acres of shelterwood creation, and 3 acres of regeneration harvests with reserves. Figure 2-1 shows the units proposed for harvest in this alternative and their silvicultural prescription.

Timber harvest vegetation treatment are determined by the silvicultural prescriptions which include detailed information for each unit and post-harvest treatment are in the Presley's Twin Analysis file at the Detroit Ranger District. A general summary of prescription features is described in this file. Regeneration units would be planted with a mix of Douglas-fir, lodgepole pine, white pine and Englemann's spruce. Final shelterwood removal would harvest remaining overstory trees not needed for wildlife snags, downed woody debris, visual retention objectives, or riparian reserve management objectives.

Alternative 4 would treat 889 acres of stands in the project area which is about 55% of the amount of acres treated in alternative 2. This would include 834 acres of shelterwood overstory removal, regeneration of 3 acres and creation of 52 acres of shelterwood stands. Full leave buffers of 150 feet would be placed on either side of all streams. Fuel treatments similar to those described in alternative 2 would occur on 182 acres (35% of the amount in alternative 2) in the project area. Fuel treatments similar to those described in alternative 2 would occur on

182 acres (65% less than in alternative 2) in the project area. Work on the road system would be similar to the work proposed in alternative 2. Changes to the temporary road system needed to access timber would include the opening of 3.0 miles of previously existing temporary logging spurs (3.5 miles less than alternative 2) and the creation of 0.4 miles of new temporary logging spurs (0.2 miles less than alternative 2).

Fuel Treatment

Fuel treatments that would occur as part of the proposed action for Presley's Twin sale include 160 acres of the following: grapple piling and burning and broadcast burning. This alternative has the lowest acres of fuel treatment. Prescribed burning for fuel treatment would take place when weather and fuels resemble spring-like conditions which include: fuels greater than three inches in diameter, fuel moistures equal to or greater than 25%, ensuring soil and duff retention levels are maintained at or below duff retention objectives. See table 2-1 for fuel treatments by unit.

Wildlife

Green Tree Retention Areas: The proposed action would prescribe treatments for green tree retention areas (GTRs) snags and downed wood. Green tree retention areas would serve to provide coarse woody debris in matrix management lands Green tree retention areas are scattered, no-harvest patches; 70% of these patches should be 2.5 to 0.5 acres in size with the remainder as individual trees (USDA & DOI, 1994). These retention areas (GTRs) would comprise 15% of each unit or, in units where no mature intact forest exists; portions of adjacent stands would be designated as GTRs. GTRs would be located during presale layout with assistance from the wildlife biologist.

Snag Creation: Standards for snag creation would be met by leaving live green trees in the harvest units during harvest and then topping these trees as necessary 4-5 years after the sale is complete. This would allow natural processes time to creating snags and down wood before they are mechanically created. Low levels of tree mortality are expected in some units where broadcast burning is proposed. In the regeneration units leave an average of 3.3 trees per acre for snags. The 3.3 snags per acre would be created on a schedule of 40 years. 1.5 trees per acre would be converted to snags after the sale, 0.8 trees per acre would be converted to snags 20 years after harvest and 1.0 tree per acre would be converted to snags 40 years after harvest. This alternative would meet the Forest Plan Standards and Guidelines for snags.

Downed Woody Debris: Currently, downed wood may exist in pieces greater than 20 feet long and 18 inches in diameter in some units. In addition to any current downed wood, from 1 to 4 trees per acre would be left in all units for future downed wood creation. Pieces would be left as full tree lengths to maximize ecological benefits and should reflect the size and species mix of the stand. Some units have a range of 2-3 or 3-4 trees per acre to be left. The actual number of trees left would depend on the size of trees available and how well they are able to meet 240 linear feet of 18 inches or larger. Larger, taller trees would require fewer individuals to

meet size and length requirements. Downed woody material would be created for each unit by leaving green trees during harvest activities and felling them after harvest is completed. See table 2-3 for downed woody debris prescriptions for alternative 4.

Hydrology

BMPs: Best Management Practices (BMPs) were used in all aspects of this sale to reduce impacts to water quality. Activities which were evaluated and designed to align with best management practices include unit design, stream course protection, landing locations, erosion control, stream crossing design, prescribed fire activities, slope and soil moisture limitations for tractor operations. A full description of BMPs can be found in the General Water Quality Best Management Practices Handbook (1988).

Riparian Reserves: In all units associated with alternative 4, full riparian reserves would be designated as no-harvest buffers.

Engineering

The proposed action would utilize, but not expand, 28.76 miles of the existing forest road system. Temporary road work is not part of the official road system network as these roads have no number and are not intended to be maintained over time. Work required on the road system would be limited to reconstruction or maintenance. Maintenance and reconstruction would include cutting hardwood trees along roads, felling hazard trees, clearing and grubbing, surface blading, replacing drainage structures, reshaping ditches and placement of aggregate surfacing. Not all roads would need reconstruction or maintenance. Treatments would be applied as necessary to facilitate timber hauling.

This alternative would open 3.0 miles of existing temporary logging spurs and create 0.4 miles of new temporary logging spurs. Temporary logging spurs are dirt roads which may need grading, clearing, rock placement or other activities in order to facilitate timber haul.

Alternative 4 as it Responds to the Significant Issues

Alternative 4 would respond to the significant issue of thinning in mature stands by not harvesting the 779 acres of commercial thinning. The desired stand condition that represents a healthy and vigorous forest, in this case, is the release of suppressed and competition stressed trees. Because there is no proposed alternative harvest method for these stands, this portion of the proposed action is dropped in alternative 4. Alternative 4 addresses the issue of connectivity and biodiversity by not harvesting the deferred harvest corridor. All stands in the corridor would be slated for commercial thinning and as they are not included in alternative 4 they would not be harvested at this time.

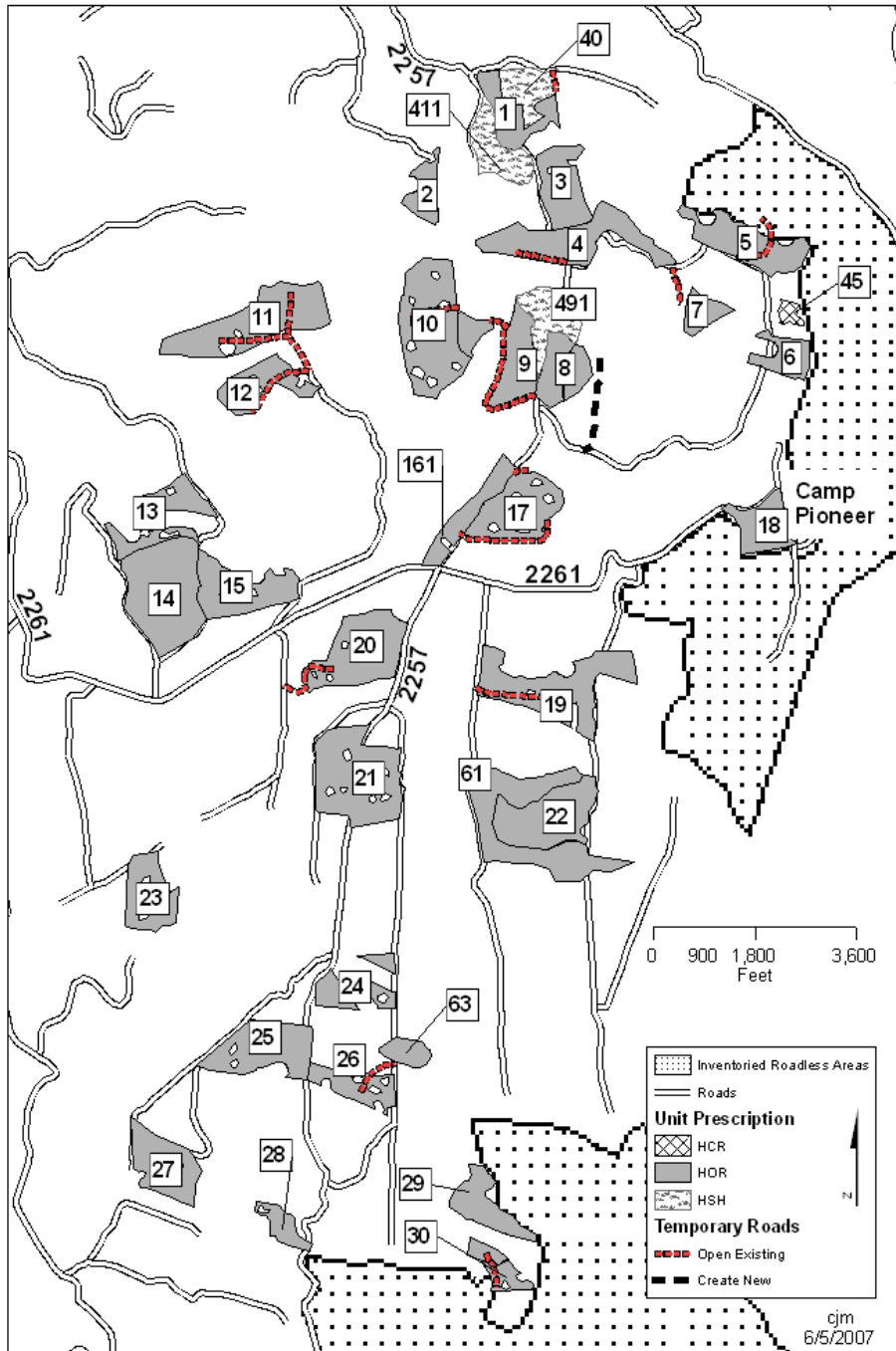


Figure 2-3 Alternative 4

Table 2-3 Alternative 4 Unit Summary

Unit	Acres	Harvest Rx	Temp Road Constr. (mi.)	Temp Road Reopen (mi.)	Fuels Treatment	Volume (MBF)	Live Trees Left for DWD (TPA)	BA/Acre Left Post Thinning
1	18	HOR	0	0.07	GP, L	40		
2	11	HOR	0	0	L	70		
3	23	HOR	0	0	L	160		
4	39	HOR	0	0.18	L	310		
5	28	HOR	0	0.15	L	160		
6	12	HOR	0	0	L	150		
7	9	HOR	0	0.13	L	50		
8*	20	HOR	0	0	L	280		
9	28	HOR	0	0.53		140		
10	48	HOR	0	0.17	L	270		
11	45	HOR	0	0.52	L	230		
12	19	HOR	0	0.26	L	90		
13	21	HOR	0	0	L	190		
14	52	HOR	0	0	L	600		
15	28	HOR	0	0	L	280		
161	16	HOR	0	0		50		
17	30	HOR	0	0	L	140		
18	19	HOR	0	0	L	80		
19	45	HOR	0	0.23	L	570		
20	37	HOR	0	0.25	L	540		
21	49	HOR	0	0	L	650		
22	36	HOR	0	0	L	550		
23	22	HOR	0	0	L	290		
24	14	HOR	0	0	L	220		
25	31	HOR	0	0	L	410		
26	15	HOR	0	0.16	L	340		
27	25	HOR	0	0	L	230		
28	8	HOR	0	0	L	70	10	
29	23	HOR	0	0	L	140	21	

Unit	Acres	Harvest Rx	Temp Road Constr. (mi.)	Temp Road Reopen (mi.)	Fuels Treatment	Volume (MBF)	Live Trees Left for DWD (TPA)	BA/Acre Left Post Thinning
30	6	HOR	0	0	L	0		
40	15	HSH	0	0	GP, L	250	38	
411	19	HSH	0	0	BCB	380	57	92 ⁴
45	3	HCR	0	0	BCB, L	80	13	
491	18	HSH	0.4	0.40	BCB, L	440	67	50
61	47	HOR	0	0		730	111	
63	8	HOR	0	0	L	100	16	
All	889		3.0	0.4	182	9300		

HOR – Shelterwood overstory removal

GP – Grapple Pile

BCB – Broadcast Burn

UB – Under Burn

L – Burning of Landings

TPA – Trees Per Acre

HSH – Shelterwood Harvest

HTH – Commercial Thin

HPP – Harvest Post and Pole

HCR – Regeneration Harvest with Reserves

MBF – Thousand Board Feet

DWD – Downed Woody Debris

*These units would be partially skyline harvested. All other units would be ground based yarded

2.3 Connected Actions Common to All Action Alternatives

2.3.1 Pre-haul maintenance and road reconstruction

Pre-haul maintenance and road reconstruction would occur at the levels specified in table 2-4 for all action alternatives. These roads are in generally good condition due to light traffic volumes and seasonal access. Needed road work involves brushing, blading, ditch reconditioning, spot surfacing placement, danger and downed tree removal, culvert inlet and outlet cleaning, and occasional culvert replacements.

Temporary Road Work would occur to facilitate harvest. In alternative 2, a total of 4.1 miles of temporary road would be either reopened or constructed, alternative 3 would need a total of 0.7 miles of temporary road work and alternative 4 would need a total of 3.4 miles of temporary road work. Table 2-4 shows the miles of temporary road work for each alternative by miles of existing roads that would need reopening and miles of new construction. Temporary roads are mapped by alternative in section 2.2. Within this section, temporary roads for alternative 2 are displayed in figure 2-1, figure 2-2 for alternative 3 and figure 2-3 for alternative 4.

Table 2-4 System and Temporary Road Work

Alternative	Forest Service System Roads		Temporary Roads	
	Pre-Haul Maintenance (mi.)	Reconstruction (mi.)	Temporary Road Reopening (mi.)	New Temporary Road Construction (mi.)
1	none	none	none	none
2	7.83	28.76	3.5	0.6
3	6.51	19.84	0.5	0.2
4	7.83	28.76	3.0	0.4

2.3.2 Yarding Methods

Yarding methods for timber sales on the Detroit District may include helicopter, skyline and ground based systems. Presley's Twin would be mostly ground based yarding as the project area sits on a flat bench. Slopes in the units are generally less than 30 percent and do not contain a high number of riparian features. These factors make ground-based yarding the most desirable type of yarding. This area also has soil characteristics and accessibility that favors ground based yarding. Ground based yarding systems would only cross ephemeral swales and only at a time when these features did not contain flowing water.

Table 2-5 Logging Systems by Alternative

Alternative	Ground Based Yarding (acres)	Skyline Yarding (acres)
1	0	0
2	1642	26
3	779	0
4	863	26

2.4 Mitigation Measures

In response to public comments on the proposal, mitigation measures were developed to ease some of the potential impacts shelterwood overstory removal, and commercial thinning may cause as part of the various action alternatives. The mitigation measures may be applied to any of the action alternatives. Mitigation measures are defined by the Council of Environmental Quality (CEQ) Regulations as:

- avoiding the impact all together by not taking a certain action or certain parts of an action,
- minimizing impacts by limiting the degree of magnitude of the action and its implementation, rectifying the impacts by repairing, rehabilitating, or restoring the affected environment,
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action or,
- compensating for the impact by replacing or providing substitute resources or environments.

A deferred harvest corridor (figure 2-4) was developed in response to the issue of connectivity and biodiversity (section 1.8.3). This corridor runs north-south through the project area and includes areas that provide unique botanical, biological and wildlife resources. The corridor is some of the least disturbed ground in the project area.

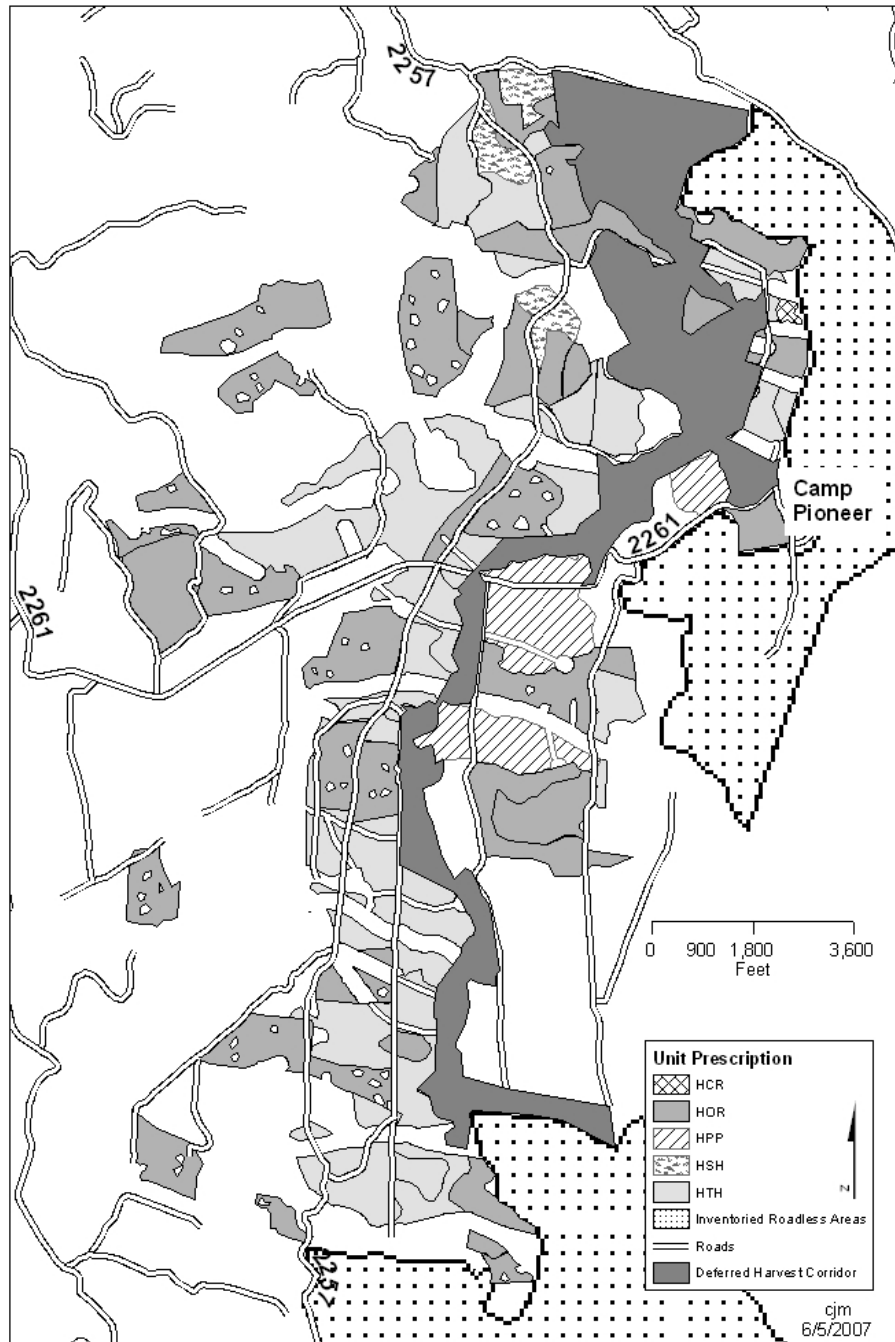


Figure 2-4 Deferred Harvest Corridor

Other mitigation measures for the Presley's Twin project are described in table 2-6. These include replanting in regeneration units, subsoiling to reduce compaction, pruning along the 2257 and 2261 roads, creation of snags and downed woody debris, noxious weed control and treatment of logging debris in visual land management allocation MA-11d.

Table 2-6 Mitigation Measures

Units	Mitigation Activity
Vegetation	
45, 491	Regeneration units would be planted with a mix of Douglas-fir, Lodgepole pine, white pine and Englemann spruce. Reforestation exams would take place one and three years after planting to ensure adequate establishment rates for crop trees.
Wildlife (Snags & Downed Woody Debris)	
1-15, 161, 17-30, 40, 411, 45, 491, 61	Snags will be created at the rate of an average of 3.3 per acre for regeneration units, shelterwood overstory removal units and shelterwood creation units
16, 41-44, 46, 47, 49, 50, 53-56, 561, 57, 59, 60, 62-64	Downed woody debris will be created at a rate of 1 tree per acre in thinning units . Downed wood would be created by reserving live green trees and then felling them within five years of harvest. The target amount of downed woody debris is 240 linear feet 18 inches or greater. If trees are less than 18 inches reserve the largest available trees.
1, 3, 8 13 14 19-21, 23, 26, 27, 161, 63	Downed woody debris will be created at a rate of 2 trees per acre in some shelterwood overstory removal units . Downed wood would be created by reserving live green trees and then felling them within five years of harvest. The target amount of downed woody debris is 240 linear feet 18 inches or greater. If trees are less than 18 inches reserve the largest available trees.
2,4,6,9,11,12, 15,17,18,24,25, 28,30,61,411	The target amount of downed woody debris is 240 linear feet 18 inches or greater. If trees are less than 18 inches reserve the largest available trees. The rate of downed woody debris creation is based on tree height and average diameter needed to provide the target amount of downed woody debris. Downed wood would be created by reserving 2-3 live green trees per acre in some shelterwood overstory removal units and then felling them within five years of harvest.
5, 7, 10, 22, 29, 40, 491, 45	The target amount of downed woody debris is 240 linear feet 18 inches or greater. If trees are less than 18 inches reserve the largest available trees. The rate of downed woody debris creation is based on tree height and average diameter needed to provide the target amount of downed woody debris. Downed wood would be created by reserving 3-4 live green trees per acre in some shelterwood overstory removal units and then felling them within five years of harvest.
Wildlife (Big Game)	
NA	Plowing of snow from the 2257 north of the 2257/520 junction would be restricted to protect big game winter range. Restrictions would be lifted if the

Units	Mitigation Activity
	purchaser pays for district personnel to check for the presence of big game during the period in question.
Botany (Noxious Weeds)	
1, 2, 13, 14, 15, 16, 17, 20, 23, 25, 27, 28	The project will be monitored for weed recruitment for two years following post harvest weed treatments.
Soils & Geology	
15, 23, 24, 27, 29	Subsoiling would occur on 10 percent of the acres in units 15, 23, 24, 27 and 29 and would lower compaction levels to comply with Forest Plan Standards and Guidelines. Subsoiling would be monitored to ensure effective implementation.
Recreation & Visuals	
14, 15, 16, 161, 18, 54, 55, 80, 81	Clean up slash, slash piles root wad debris and landing debris and revegetate sites in MA-11d along the 2261 and 2257 roads. As much debris as possible should be cleaned up by chunking and other fuel reduction methods, debris that cannot be cleaned up onsite must be hauled to a suitable location. This activity must be done within 1 year of completion of harvest.
1,3,4,8,9,161,17, 20,21,24,25,26,28, 41,411,42,491, 50, 54,55,56,561,59, 60,62,64	Clean up slash, slash piles root wad debris and landing debris and revegetate sites in MA-14 along the 2261 and 2257 roads. As much debris as possible should be cleaned up by chunking and other fuel reduction methods, debris that cannot be cleaned up onsite must be hauled to a suitable location. This activity must be done within 5 years of completion of harvest.
All	Haul would be prohibited on the 2261 road from Camp Pioneer Boy Scout Camp to the highway 22 junction between the last weekend in June and the second weekend in August. Haul restrictions would be waived if the purchaser chooses to place flaggers with communication devices at the top and bottom of the 2261 road to control civilian traffic during times of haul.
All	All operations including haul will be prohibited on the opening weekend (Sat/Sun) of the following hunting seasons: High Cascades Buck Rifle, Western Oregon Buck season and Elk season.
All	During paving operations, roads should be signed for notification of public traffic including expected delay times. Information should also be available at the Detroit Ranger District front desk.
All	Roads shall be signed and posted to warn travelers of logging traffic.
All	Coordinate paving work with Camp Pioneer so their activities can still take place. This will require when they can use the road for incidental use such as garbage hauling and staff travel and allow for emergency exits. Paving should not occur on weekends when scouts are traveling to or from the camp.

2.5 Project Design Measures

Design measures are actions common to most projects that provide resource protection to ensure activities are consistent with the Willamette Forest Plan Standards and Guidelines. All design measures would be in place unless directed otherwise or waived by Forest Service personnel. Design measures provide resource protections that ensure implementation activities remain consistent with Willamette Forest Plan Standards and Guidelines. Common design measures are listed in table 2-7.

Table 2-7 Common Design Measures

Units	Design Measures	Dates
Fuels & Air Quality		
All	Conduct a post-harvest field evaluation to verify actual fuel loadings. Reduce fuel loading in harvest units that exceed the maximum levels specified in the Forest Plan. Fuel treatments by unit are described in tables 2-1, 2-2 and 2-3. Fuel loadings should not exceed 7-11 tons per acre in the 0-3 inch size class and 8-12 tons per acre in the 3-9 inch diameter class.	NA
All	Conduct fuel burning to meet air quality requirements specified by the state of Oregon Smoke Management Plan	During burning season
Botany (Noxious Weeds and Special Habitats)		
1, 2, 13, 14, 15, 16, 17, 20	Weed populations in the project area will be surveyed and treated prior to harvest activities.	NA
All	Pressure wash construction and logging equipment prior to entering the sale area.	NA
All	Obtain gravel for road construction and reconstruction from a weed-free rock source.	NA
All	Minimize areas of soil disturbance during all harvest activities including spur road construction and re-opening, road reconstruction, fuels treatment, etc. Seed all heavily disturbed areas with native species, including landings and subsoiled skid roads to reduce weed establishment.	NA
All	Berm, gate, or rip and seed any new roads and re-opened roads to reduce disturbance and incoming seed due to vehicular traffic.	NA
All	Special habitats, including seeps rock outcrops and gardens, caves, and meadows, would be protected in accordance with the Forest Plan and the Special Habitat Management Guide. Protection measures include: <ul style="list-style-type: none"> • Directional falling away from special habitats • Avoiding placement of equipment, landings, skyline corridors, 	NA

Units	Design Measures	Dates
	and designated skid roads through special habitats <ul style="list-style-type: none"> • No harvest buffers (which may include Green Tree Retention area but should not include wildlife trees) 	
Soils		
All	Retain 40-60 percent of the existing duff	NA
All (except parts of 8 & 49)	On units where ground based yarding is prescribed, Tractor skid roads must be located in advance of harvest activities.	NA
All	Ground-based equipment should operate in the dry season this measure may be waived by Forest Service personnel if dry conditions exist outside this season. Unclassified or temporary roads used outside the standard operating season, may need to be rocked, snow covered, or frozen to reduce the potential for erosion.	Dry Season (May – October)
All	Open roads should be storm proofed if they have to set through extended periods of wet weather.	NA
All	Horses and ground -based equipment are usually limited to side slopes less than 30%, unless otherwise directed by Forest Service personnel, in order to reduce soil disturbance.	NA
All	Ground-based skidding equipment shall stay on designated skid trails. Ground-based skid trails would be pre-designated and pre-approved before use. The Locate Tractor Skid Road (LTSR) provision would be included in the timber sale contract. Skid roads should not exceed 15 feet in width, and the objective is to maintain a 10 to 12 foot width throughout the length. Where practical the skidder, cat, or processor/forwarder should travel on slash to reduce off site soil erosion and lessen soil compaction.	NA
All	At the completion of harvest activities, limbs and woody debris should be placed on exposed soil to reduce off site erosion.	NA
All	Trees, not designated for harvest in riparian buffers that need to be cut to facilitate harvest operations, should be dropped into the stream if possible to aid in woody debris recruitment.	NA
All	Avoid disturbance to the existing large down woody debris.	NA
All	At the completion of harvest activities, tractor skid roads should be water barred and scarified as needed. Waterbars should be “keyed into” the cut bank and have a clear outlet on the down hill side.	NA
All	Skid roads and landings should be sub-soiled in order to reduce compaction and return the site to near original productivity. Subsoiling needs to be considered in light of the potential for root pruning,	NA

Units	Design Measures		Dates
	damage to existing regeneration, and the increased amount of soil disturbance.		
Hydrology			
161,17,50,53,54,5,60,62,81,82	No harvest riparian buffers of 50 feet on both sides of the streams are prescribed to minimize sediment delivery to streams and reduce the potential for temperature increases. Buffers are measured from the trees nearest the stream not water's edge.		NA
2,4,5,6,7,9,10,11,13,15,16,17,19,20,24,29,30,41,42,43,44,45,49,491,50,53,56,57,59,60,62,64,82	No harvest riparian buffers of 150 feet on both sides of the streams are prescribed to minimize sediment delivery to streams and reduce the potential for temperature increases. Buffers are measured out from the trees growing nearest to the stream not from the edge of the water or stream bed.		NA
All	Temporary skid roads would cross ephemeral swales only during dry periods and at a right angle to stream flow.		Dry Season (May – October)
	Objective	Best Management Practices	
All	Continue recovery of downstream riparian, channel and water quality conditions.	Design units to insure channel bank stability, and provide adequate buffers to reduce sediment inputs and minimize peak flow effects (BMP T-2; T-7; T-8; T-12). Boundaries are placed in such a manner to avoid compromising bank stability	NA
All	Maintain or improve the quality of water for domestic and fisheries users.	Designate riparian management units and specific prescriptions for each individual unit adjacent to stream courses requiring protection (BMP; T-7).	NA
All	Maintain natural filtration of surface, overland flow, through post sale activities.	Establish appropriate riparian management units and establish fire lines to ensure maintenance of established buffers, filter strips (BMP T-7; T-8; F-2; F-3).	NA
All	Maintain or improve channel bank stability.	Establish riparian management units that include channel bank areas and or establish marking prescriptions that prevent any tree attributing to bank stability from being marked (BMP T-2; T-6; T-7; T-8).	NA
Fisheries			
All	A stable fill would be constructed across all streams		NA

Units	Design Measures	Dates
All	Construction and or maintenance of roads would not be done when soils are saturated or runoff occurs.	NA
All	Activities occurring in perennial streams would comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on in-stream work activities	NA
All	Erosion control measures would be implemented as soon as possible All after soils have been disturbed.	NA
All	Best Management Practices (BMP's), including placement of barriers (to reduce sediment input to stream), provision of flow bypass, and other applicable measures, would be included in project design as necessary to control sediment.	NA
Recreation & Visuals		
14, 15,16,161 18,54,55,80, 81	Retain 10 dominant and codominant trees per acre in MA-11d.	NA
14, 15,16,161 18,54,55,80, 81	Flush cut stumps within 200 feet of the road or within view of the road whichever is less in management allocation 11d.	NA
Roads		
All	Purchaser is responsible for repairing road damage that occurs during logging operations.	NA
All	Maintain all haul routes in stable conditions.	NA
All	Excessive dust would trigger watering or other dust abatement activities.	NA
Heritage Resources		
All	All National Register of Historic Places (NRHP) eligible sites and potentially eligible sites would be avoided during all project activities.	NA
All	Changes to the current unit configurations and/or the addition of any new units, would require consultation with the District Archaeologist in order to protect known and unknown heritage resources.	NA
All	Project activities planned outside of the area defined in the heritage resource inventory schema must be coordinated with the district archaeologist prior to initiation. This includes the establishment of harvest and helicopter landings, guy-line equipment anchors, slash burning, removal of roadside danger trees, and silvicultural treatments.	NA
All	Prior to cultivating temporary spur roads after harvest activities, a re-entry survey, coordinated with the district archeologist must be conducted in those areas deemed high probability for the occurrence of heritage resources.	NA
All	Include contract provision for protection measures needed for plants,	NA

Units	Design Measures	Dates
	animals, cultural resources, and cave resources in all project contracts. This clause describes the procedures to follow in the event heritage resources are discovered and how to protect such resources	

2.6 Comparison of Alternatives _____

Table 2-8 Comparison of Alternatives

Management Activity	Units	Alt 1	Alt 2	Alt 3	Alt 4
Vegetation					
Commercial Thinning	Acres	0	633	633	0
Shelterwood Overstory Removal	Acres	0	834	0	834
Regeneration Harvest w/ Reserves	Acres	0	3	0	3
Shelterwood Creation	Acres	0	52	0	52
Post and Pole Harvest	Acres	0	146	146	0
Total Harvest	Acres	0	1668	779	889
Estimated Timber Volume	MMBF	0	18.8	9.5	9.3
Logging Systems					
Ground Based Harvest	Acres	0	1642	779	863
Skyline Harvest	Acres	0	26	0	26
Fire & Fuels					
Grapple Pile and Burn	Acres	0	412	378	121
Broadcast Burning	Acres	0	40	0	40
Underburning	Acres	0	41	41	0
Total Fuel Management	Acres	0	493	419	161
Wildlife					
Marion BGEA**					
Size and Spacing of Forage (HEs) (Min Forest Plan Value = .40)		.78			
Cover (HEc) (Min Forest Plan Value = .40)		.59			

Management Activity	Units	Alt 1	Alt 2	Alt 3	Alt 4
Forage (HEf) (Min Forest Plan Value = .40)		.40	thinning units • little, if any, change in habitat type or value in final shelterwood removal units	thinning units	
Road Density (HEr) (Min Forest Plan Value = .40)		.56			
Overall (HEI) (Min Forest Plan Value = .50)		.57			
Upper North Santiam BGEA**					
Size and Spacing of Forage (HEs) (Min Forest Plan Value = .40)	Existing Habitat Effectiveness Value	.49	• may provide additional forage for a few years until the canopy closes in thinning units • little, if any, change in habitat type or value in final shelterwood removal units	• may provide additional forage for a few years until the canopy closes in thinning units	• little if any change in habitat type or value in final shelterwood removal units
Cover (HEc) (Min Forest Plan Value = .40)		.53			
Forage (HEf) (Min Forest Plan Value = .40)		.40			
Road Density (HEr) (Min Forest Plan Value = .40)		.66			
Overall (HEI) (Min Forest Plan Value = .50)		.51			
Snags & Downed Wood					
Live Trees Left for DWD	Est. #	NA	82 to 104	0	82 to 104
Live Trees Left for Snags	Est. #	NA	4101	1168	2933
Existing WL clumps	Y/N	NA	Yes	No	Yes
Green Tree Retention Areas	Acres	0	133	0	133
Spotted Owl – Habitat Removed					
Nesting	Ac	0	0	0	0
Foraging	Ac	0	22	0	22
Dispersal					

Management Activity	Units	Alt 1	Alt 2	Alt 3	Alt 4
Area of Concern	Ac	0	109	0	109
Matrix	Ac	0	145	0	145
Total	Ac		284	0	284
Soils & Geology					
Subsoiling to Reduce Compaction	Acres	0	98	0	98
Hydrology & Fisheries					
Changes in Risk of Altered Peak Flows (Aggregate Recovery Percentage) NOTE: Midpoint represents a minimum safe level of vegetative recovery to prevent substantial alteration of peak flow regimes as a result of management activities. Current values are 21.44% above midpoint	% Change in ARP above the midpoint value	0	-1.10%	-1.10%	-1.10%
Riparian Reserves Treated, % of Riparian Reserve found within the Planning Area	%	0	19%	19%	0%
Probability of measurable negative effects occurring in occupied fish habitat	NA	zero	zero	zero	zero
Recreation & Visual Quality					
Noise Disturbance Generated by Harvest	Days	0	222	149	92
Required for Hauling (Log Traffic on Roads)	Days	0	188	94	94
Operations Audible Near Camp Pioneer	Days	0	20	15	8
Operations Audible w/in 1 mile of Wilderness Trails	Days	0	84	67	31
Engineering (Roads)					
Road Pre-Haul Maintenance	Miles	0	7.83	6.51	7.83
Road Reconstruction System Rds.	Miles	0	28.76	19.84	28.76
Road Paving (2261)	Miles	0	1.52	0	1.52
Opening Existing Temp. Roads	Miles	0	3.5	0.5	3.0
New Temp. Road Construction	Miles	0	0.6	0.2	0.4
Economic Analysis					
Gross value	Thousand \$	0	10,182	4,908	5,334
Associated Costs	Thousand \$	0	4,765	2,716	3,059

Management Activity	Units	Alt 1	Alt 2	Alt 3	Alt 4
Appraisal Competition Adjustment	Thousand \$	0	610	287	275
Net Appraised Value (Gross value - Assoc. Costs - Appr. Comp. Adjustment)	Thousand \$	0	4,879	2,589	2,476
Cost/Benefit Ratio (Gross value/Associated costs)	Ratio	0	1.89	1.63	1.60

**** Existing habitat effectiveness values are shown. Treatment would not measurably change model values. Explanation of anticipated effects is provided by treatment type.**

3. Existing Conditions & Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

3.1 Past, Present and Reasonably Foreseeable Future Activities

The cumulative effects discussed in this section include an analysis and a concise description of the identifiable present effects of past actions to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for action and its alternatives may have a continuing, additive, and significant relationship to those effects. The cumulative effects of the proposed action and the alternatives in this analysis are primarily based on the aggregate effects of the past, present, and reasonably foreseeable future actions. Individual effects of past actions are not listed or analyzed, and are not necessary to describe the cumulative effects of this proposal or the alternatives. (CEQ Memorandum, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005.)

The Presley's Twin Project falls into two sub-watersheds 5% of the units are in the Marion Creek sub-watershed and 95% of the units are in the Straight Creek sub-watershed. These two sub-watersheds together cover 46,220 acres. The project area covers 6141 acres. There are three private parcels that are partially or wholly in the Marion Creek sub-watershed which cover 470 acres. At this time there are no planned harvest or road maintenance activities on these lands. Cumulative effects areas analyzed for each resource differ but several resources analyzed cumulative effects as the Straight and Marion Creek sub-watersheds. In general the past, present

and reasonably foreseeable future actions in the two sub-watersheds are applicable to all cumulative effects analyses.

3.1.1 Analysis Scales

There are five major analysis scales of interest for this environmental assessment. 1) The Upper North Santiam Watershed (UNS) is the largest analysis scale and is generally used by the Upper North Santiam Watershed Assessment. 2) Planning subdrainages (Marion and Upper North Santiam) are used to analyze compliance with several Willamette Forest Plan requirements. 3) sub-watersheds (Straight Creek and Marion Creek) are used for analysis by several resource areas 4) The project area, roughly 6,000 acres that contains the sale area and surrounding acres, is an analysis scale for some background information, direct and indirect effects as well as the cumulative effects analysis. The project area western boundary is FS Road #2261-405 and eastern boundary is Mt Jefferson South - Inventoried Roadless Area and Mt. Jefferson Wilderness. The north and south boundaries are delineated on sub-watershed boundaries. 5) The 1668 acres of actual units are the smallest scale of analysis discussed in the document. These analysis scales are depicted in Figure 3-1. Other scales and areas used for analysis included, Big Game Emphasis Areas, the Spotted Owl Area of Concern, the Mt. Jefferson Wilderness, and adjoining Late Successional Reserves.

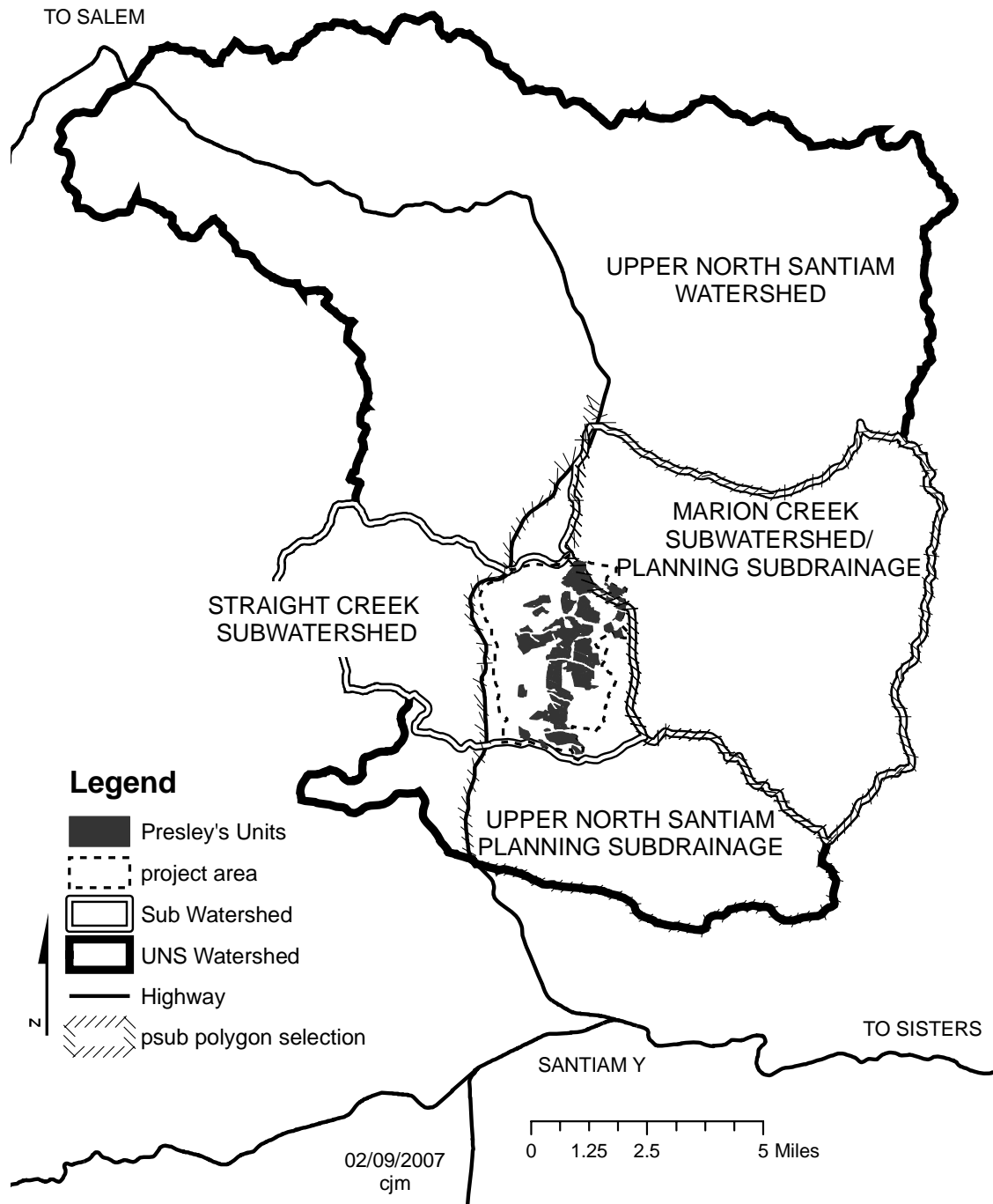


Figure 3-1 Analysis Scales

3.1.2 Vegetation and Road System Management

In the foreseeable future, the Detroit Ranger District is likely to plan pre-commercial and commercial thinning of managed stands in this watershed. No harvest of natural stands is currently planned beyond the Presley Twin project. The district does not anticipate any new road

building or construction, as part of the forest service system road network, in the watershed the next five years.

The private land discussed in section 3.1 is currently forested. This land has been held by the Marion Forks Investment Company and at this time there are no future harvest or road maintenance activities planned on these lands.

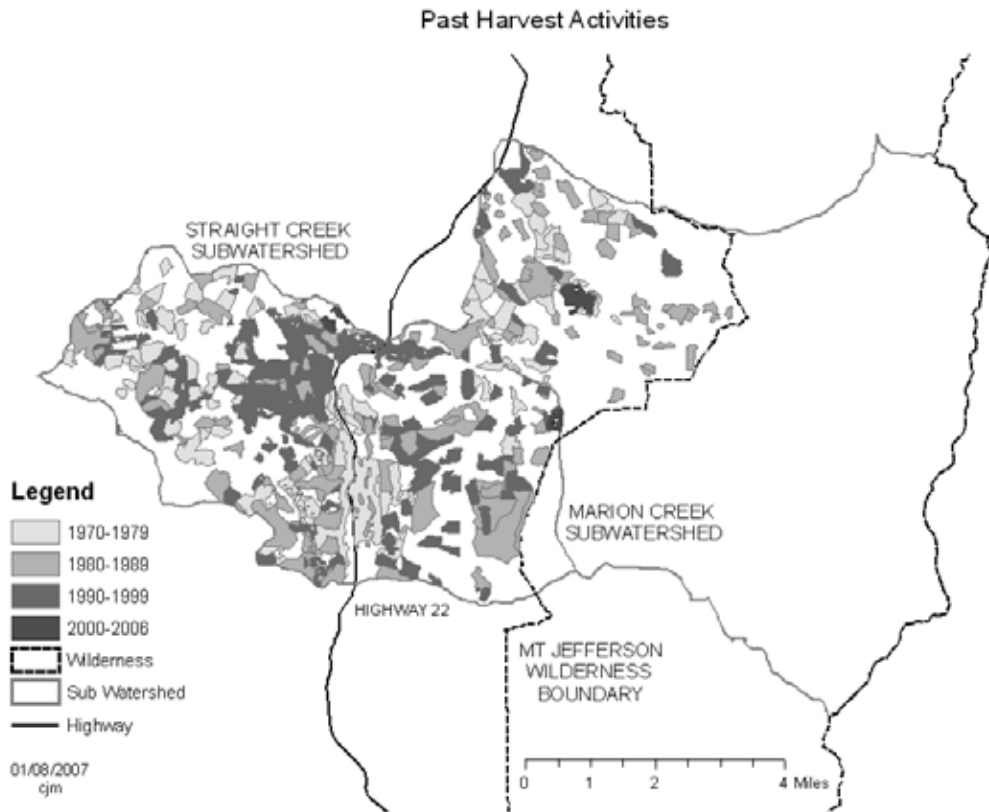


Figure 3-2 Past Harvest Activities

Table 3-1 Past Timber Harvest in Marion and Straight Creek Sub-Watersheds

Decade	Acres of Shelterwood overstory removal	Acres of Partial Cut/Salvage	Acres of Shelterwood	Acres of Precommercial Thin	Acres of Commercial Thin
1940-1949	0	0	0	0	0
1950-1959	921	0	0	0	0
1960-1969	911	26	0	0	0
1970-1979	1116	1392	145	60	5020
1980-1989	3509	831	700	791	150
1990-1999	946	2605	783	1781	0
2000-2006	31	43	0	1855	185
Total:	7434	4897	1628	4587	837

3.1.3 Fire

The B&B Complex was the result of the merging of the Bear Butte and Booth Fires which both started August 19, 2003. The complex burned 90,769 acres. 40,500 acres burned in the Mt. Jefferson Wilderness on both the Willamette and Deschutes National Forests. The B&B fire burned 10,477 acres – roughly 25 percent – of the Marion sub-drainage.

The Puzzle Fire was discovered on August 19, 2006 in the Puzzle Creek Drainage. The fire burned through heavy fuels and beetle killed stands to a final size of 6,340 acres, most of which was in the Marion Creek sub-watershed. See figure 3-4 for a depiction of the area burned as part of the B&B fire.

3.1.4 Transportation Systems

The Straight Creek and Marion Creek sub-watersheds include approximately 5 miles of State Highway 22, and 141 miles of Forest system roads. Of the 141 miles of Forest System Roads, approximately 3.4 miles are closed with gates, berms or other structures. Some of these structures have been vandalized or become dilapidated over time. Many of these gates may be replaced as part of the post sale resource enhancement projects if funding is available (Section 3.1.6). Forest Service system roads receive annual maintenance in accordance with established road management objectives. Road maintenance work includes activities to reduce brush, clean out drainages, and repair road surfaces on many of the key and secondary roads in the project area (Willamette Roads Analysis, 2003).

3.1.5 Stream Restoration

Several stream enhancement projects are planned to occur in the foreseeable future within the Straight Creek sub-watershed. Large woody material would be added to Lynx Creek and maintained in the North Santiam River. Dispersed site restoration, including soil decompaction and boulder placement, are also slated for future completion. These projects would move stream condition towards the desired future condition for the sub-watershed.

3.1.6 Potential Post Sale Resource Enhancement Projects

Depending on the amount of available funding that may result from the sale of the Presley's Twin timber sale, any number of the following resource enhancement projects could be implemented. These projects are not intended to offset other effects of this project. Projects are disclosed here because if monies are generated by the Presley's Twin timber sale, these projects would be the first to be implemented. All post sale resource enhancement projects are listed in Appendix D. Some of the projects include:

- Subsoiling to reduce compaction in units other than those listed in table 2-6.
- Pruning along the 2257 and 2261 roads for fire and fuels reduction purposes
- Visual restoration of landings along the 2257 and 2261 roads in MA-14a
- Pre-commercial thinning on about 900 acres of young stands
- Gate replacement on old derelict gates
- Reestablishment of berm devices that are no longer functional
- Aerial fertilization of stands to improve growth

3.2 Vegetation

3.2.1 Introduction – Vegetation

Stands identified for treatment under this proposal would respond with increased growth of the residual trees and would experience lower mortality levels from insects and diseases. The severity of future wildfires in commercial thinning units would be reduced by removing ladder fuels, increasing tree spacing, increasing stand diameter by leaving larger diameter dominant trees and through treatment of hazardous fuels. Improving the health and vigor of stands prescribed for thinning would result in stands that are more resilient to damaging agents and would allow a wider array of stand management options in the future. Shelterwood overstory removal treatments, pre-commercial thinning, fertilization and white pine pruning would allow the understory crop stands to attain growth rates more consistent with Forest Plan objectives for timber management and accelerate the development of larger diameter stands that are desirable to meet other non-timber resource objectives. Regeneration treatments would replace disease infected and poor vigor stands with healthy, mixed species plantations that are able to attain Forest Plan growth and yield objectives.

3.2.3 Regulatory Framework – Vegetation

- Willamette National Forest Plan Standards and Guidelines (FW-181, 182, 188, 189, 190, 192, 193)

3.2.4 Analysis Methods – Vegetation

Potential treatment stands for this project were identified by vegetation typing on aerial photos, GIS queries and field visits. Stand examinations were conducted on all prescribed stands to collect information on species, diameter, trees per acre, insects, diseases and other damaging agents. Stand and field exams were done at various levels of intensity. Second-growth stands with the greatest potential for commercial thinning received the more intensive exams. Existing shelterwood stands received less intense sampling due to their much simpler stand structure. Stand exam field data was processed using either the Atterbury exam software or through input into an Excel spreadsheet for calculation of overstory size and density in the shelterwood stands. Individual stand silvicultural prescriptions were prepared following field reconnaissance incorporating stand exam data and field notes. Projections of future growth and yield to determine the effects of treatments were modeled using both the Forest Vegetation Simulator (FVS) and Stand Visualization System (SVS).

Commercial Thinning

Stand parameters are compared with growth models (relative density by Drew and Flewelling 1979) for similar stands to determine the level of thinning needed. Relative density is a proportion of maximum possible density for a particular species. The maximum possible relative density for any given species is 1.0. Douglas-fir was the species used as the basis for relative density calculations for this project since it was the dominant species in most stands in terms of a percentage of dominant crown class trees and basal area. For Douglas-fir, a relative density of .55 and above has been determined to be the point where imminent competition mortality is likely to occur. Recommended optimum density for managing Douglas-fir to maximize gross production is within the range of .4 to .55 relative density. Densities lower than .4 may be selected as a goal when greater diameter growth is desired for increased product value or to meet other resource objectives. The cost and frequency of harvest reentries also is a factor in determining the density selected. Due to past partial cutting during the 1970's, a number of stands are currently clumpy with densities varying from low to high within the same stand. These stands may have average relative densities that do not appear to indicate a need for thinning but because substantial portions of the stands are very dense, thinning would benefit those portions of the stand. Managed yield scenarios for Douglas-fir modeled for the current Willamette National Forest Plan (USDA 1984) generally resulted in a post-thinning relative density ranging from .30 to .35. Treatment recommendations were also based on a variety of insect and disease factors present at different levels in all stands.

Shelterwood Overstory Removal

The shelterwood units designated for shelterwood overstory removal in the project were originally prescribed as a method to minimize seedling damage from late spring frosts. Removal of the remaining overstory is a subsequent step in the shelterwood system once the overstory is no longer needed to protect the regenerated stand (Smith 1962). Retaining the overstory beyond the period needed for protection results in suppression of the regenerated stand (Oliver and Larsen, 1996) Delay in removal of the overstory also becomes more difficult as the understory grows taller. As the understory trees grow larger the potential for damage as a result of felling the overstory increases. Existing shelterwoods were selected for shelterwood overstory removal based on the condition of the regenerated understory as well as a determination that frost protection is no longer needed. Currently, overstory stands are not meeting growth and yield objectives specified in the Forest Plan Objectives. Retention of the overstory portion of these stands is not required to meet other resource Standards and Guidelines. Some overstory trees were retained to meet Standards and Guidelines for green tree retention, snags and visual objectives along the 2261 road. Some of the shelterwood units examined contained too few trees per acre to meet both Forest Plan standards and provide a viable amount of timber volume to offset harvesting costs. These units were recommended for no treatment. Shelterwood overstory removal would not occur in Riparian Reserves.

Regeneration Treatment - Shelterwood

Several small regeneration treatments were needed to address severe dwarf mistletoe infections in mountain hemlock, western hemlock and Pacific silver fir. Insect and disease factors, poor vigor as a result of long term high growth conditions limited the number of available healthy trees. A shelterwood harvest was prescribed as the regeneration method in order to provide frost protection for planted trees and natural regeneration. Enough healthy trees exist to serve as the remaining overstory.

Post and Pole Treatment

Due to high variable stocking, these stands are economically marginal at this point in time. The stands could benefit from sanitation of selected species and thinning of denser clumps. Poor vigor ponderosa pine, blister rust infected white pine, lodgepole pine and suppressed trees of all species would be targeted for removal. Due to the high variability of treatment, growth modeling was not considered appropriate for these stands.

3.2.5 Desired Future Condition – Vegetation

Willamette National Forest Plan

The treatments proposed in this project would include planting of units prescribed for regeneration treatments. A mix of tree species native to the project area would be planted and additional species would regenerate naturally following harvest treatments. Shelterwood overstory removals of existing shelterwoods are prescribed to improve vigor and growth of established understory trees. Commercial thinning of second-growth stands is prescribed to maintain growth and vigor reduce losses from diseases, insects, and fire. Precommercial thinning and fertilization of stands is proposed to improve the growth and vigor of existing plantations. Pruning of western white pine is prescribed to reduce mortality from blister rust.

Upper North Santiam Watershed Analysis – (USDA 1995)

The watershed analysis restated objectives for commercial timber harvest, and special forest products, maintaining and enhancing the growth and vigor of managed stands, and increasing ecological diversity. “In matrix, stands in these (9” to 21” DBH) size classes would be considered for thinning to achieve recommended levels for optimum growth or to maintain stands for longer periods. Generally, stands which have reached 95% of the culmination of mean annual increment would be considered for regeneration. In riparian reserves, the primary purpose would be to develop desired stand structure with emphasis on growing large trees and logs and other late successional characteristics.” Specific recommendations for Matrix vegetation management are:

Provide commercial products through commercial timber sales including regeneration harvests, commercial thinnings, salvages, and other partial cutting, and through special forest products sales.

Maintain and enhance growth and health of managed stands, assure reforestation within 5 years of harvest, through pre-commercial thinning, tree planting, pruning for wood quality and white pine blister rust control, tree release from competing vegetation, and animal damage control.

Increase ecological diversity in order to create big forage through regeneration cutting, and seeding winter range and beargrass dominated sites.

Restore the role of natural underburning through understory removals and prescribed underburning.

Existing Condition – Vegetation

The project area is characterized by managed, planted, and naturally regenerated stands. All managed stands are less than 50 years old. Naturally regenerated stands are predominated by those in the 100 to 190 year age classes. Except for 25 acres, all proposed harvest units have had a previous harvest entry. These previous harvest entries involved ground based harvesting of selected large, high-value trees. The activities left a patchy stand that is dense and overstocked

and also has isolated openings where skid roads or clumps of trees were removed. Unharvested stands, greater than 200 years old, are not found within the project area due to past fire history and timber harvest. Scattered, remnant old-growth trees that have survived past fires and timber harvesting, and occur in a few stands.

Stands within the project area are characterized by two plant association series (Hemstrom 1987). The mountain hemlock series represents about 80 percent of the stands surveyed and the Pacific silver fir series represents the remaining 20 percent. All of the plant associations found within the project area are characterized as having short growing seasons, heavy snowpacks, and late spring frosts. Stands proposed for treatment are primarily in two structural stages (Oliver and Larsen 1996). Shelterwood overstory removal stands in existing shelterwoods are in the stand initiation stage. Stands proposed for thinning or regeneration cutting are in the stem exclusion stage. Some of these thinning stands may have components of understory re-initiation due the effect of past salvage harvests. In total there are 2160 acres in stand initiation, 2975 acres of stem exclusion, and 384 acres of non-forest. A map of the project area structural stages is depicted in figure 3-3.

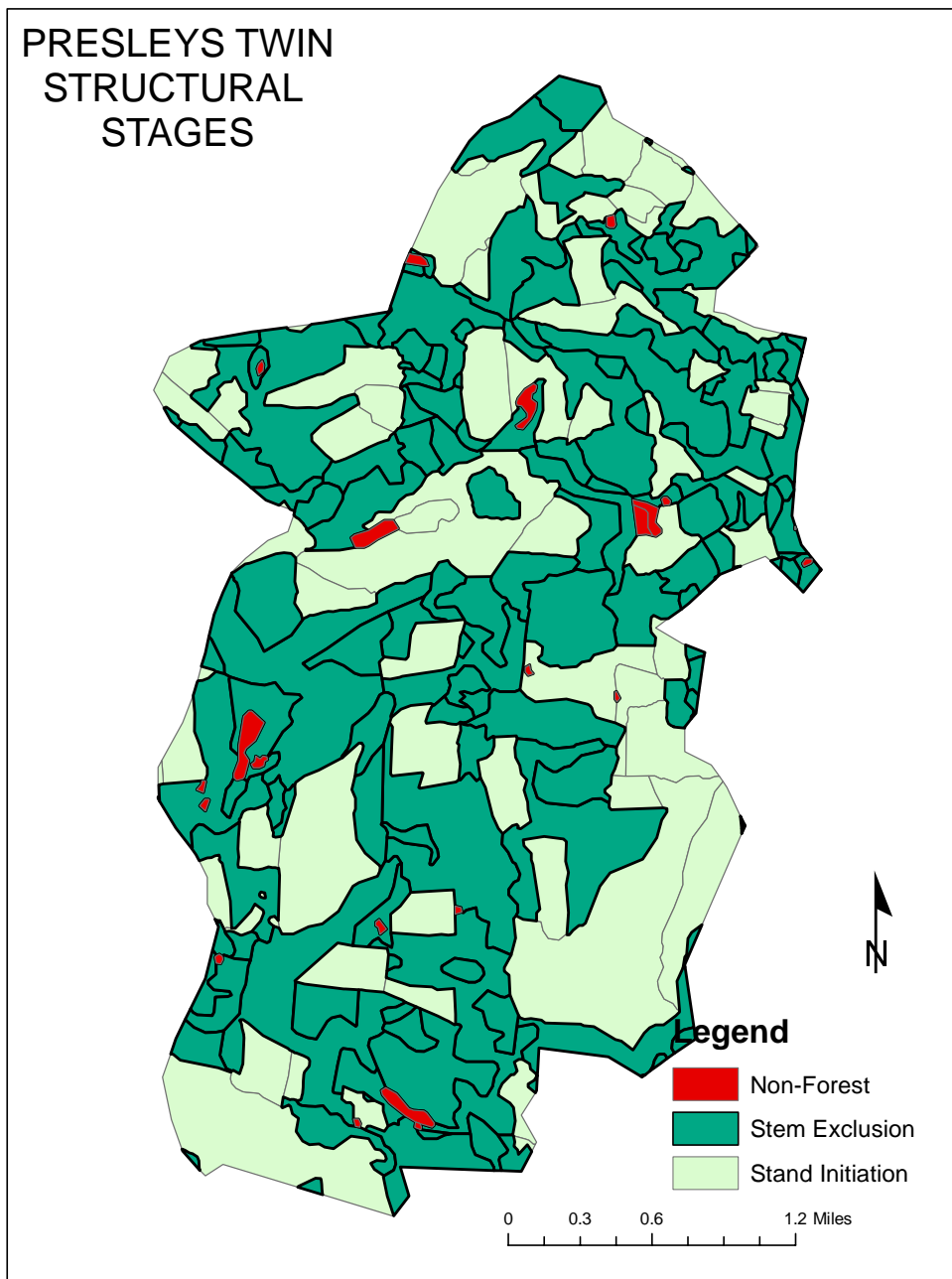


Figure 3-3 Presley's Twin Structural Stages

Stand replacement fire has greatly impacted the character and composition of the project area first in the mid to late 1800's and recently in 2003 and 2006. Stand replacing fires in the mid to late 1800's covered most of the project area leaving few remnant trees. Regeneration following these fires resulted in a variety of tree species, varying from nearly pure Douglas-fir stands to more mixed species stands with components of Douglas-fir, Pacific silver fir, mountain hemlock, western white pine, lodgepole pine, western hemlock, noble fir, and Engelmann spruce. Tree species composition, age, size class, and mortality of stands proposed for commercial thinning and regeneration treatments are similar to conditions in the areas burned in 2003 and

2006. Due to the high densities, mortality, and proximity to the crest of the Cascades these stands are increasingly susceptible to stand replacing fires. Stands slated for commercial thinning originated as a result of these stand replacement fires.

Commercial thinning stands can be broken into two age classes and three groups of similar relative density. Stands in the 95 to 120 year age originated from one of two closely timed fires. Stands in the 145 to 190 years, except for one 190 year old stand, originated from one fire. The relative density for each age class can be broken down into groups of high ($\geq .55$), medium (.35 to .55) and low ($< .35$) relative density. There are no low relative density stands in the 145-190 year age class.

Insect and disease agents such as white pine blister rust, western spruce budworm, mountain pine beetle, fir engraver beetle, dwarf mistletoe and phellinus root rot are all active in the project area. Beginning in the early 1900's, white pine was greatly reduced in abundance due to white pine blister rust, an introduced disease. Planting with rust resistant seedlings has helped restore white pine to portions of the project area.



Figure 3-4 Proximity of B&B fire to Presley's Twin project area

During the late 1980's and early 1990's, western spruce budworm caused defoliation of several trees species, especially on the east side of the project area. This was one of several infestations that have been documented since the late 1940's (Dolph 1980). The defoliation resulted in direct mortality of some trees, top kill, reduced live crown growth and increased mortality from insects.

Recently, an increase in mountain pine beetle caused mortality in lodgepole pine has been recorded during annual aerial detection surveys along the crest of the Cascades. Mortality was observed as a result of this infestation in 2005.

Fir engraver beetle caused mortality in Pacific silver fir was found in most stands with the most susceptible trees being small diameter trees in denser clumps.

Dwarf mistletoe infections in mountain and western hemlock and in silver fir are severe in several stands.

Douglas-fir beetle occurs throughout the project but has generally caused minor damage.

Phellinus root rot was found in one stand, affecting about 5 acres. These damaging agents, along with other suppression related mortality in overly dense stands has resulted in elevated levels of fuel accumulation over the past fifteen years (Hummel and Agee 2003).

Past timber harvest dating back to about 1960, has also affected the development of existing conditions in the project area. Reforestation of early clearcuts was difficult due to substantial frost damage. In the early 1970's, partial cutting through the removal of true firs, hemlocks, and white pine was conducted across the project area. In some stands, all large old-growth trees were removed. Removals were highly variable depending on the species mix of the stands entered. In some stands, these removals stimulated new regeneration, or released a previously suppressed understory, and in some stands the effect was minimal.

Shelterwood harvests were the primary silvicultural technique used in the 1980's and 1990's. Shelterwoods were prescribed to lessen the potential for frost damage to regenerating trees. Beargrass competition with tree regeneration is a major impediment to tree planting survival and growth. Sub-soiling has been used in some plantations to reduce beargrass while also reducing soil compaction. There are approximately 1200 acres of plantations with an existing overstory as a result of shelterwood harvest treatments implemented 15-20 years ago. Understory trees are now of sufficient size that they no longer need frost protection. Prolonged retention of the existing overstory would have a dampening impact on the growth of the understory. As the height of understory increases, it is also increasingly susceptible to damage from removal of the overstory.

The 100 to 190 year-old potential thinning stands are generally in excess of recommended stocking levels and relative density. These stands are experiencing suppression related mortality.



Figure 3-5 1992 Spruce Budworm Defoliation – Units 18, 80 and 81 shown

3.2.7 Environmental Consequences – Vegetation

Shelterwood overstory removals – Direct and Indirect Effects

Shelterwood overstory removals are prescribed in order to complete the final phase of past shelterwood treatments that were prescribed to protect regenerating trees from frost. Retention of the overstory beyond those trees needed to meet Standards and Guidelines is detrimental to the growth of the future crop stand and is not consistent with timber management objectives in Management Area 14a-General Forest/Matrix lands. Root competition for moisture and nutrients and shading effects of the overstory trees substantially reduce the growth of the understory (Oliver and Larsen 1996). Total volume production cannot be increased beyond the capacity of the site and given the size and number of trees per acre present on the proposed units, retention of the present overstory density would come at the expense of reduced understory development. Shading intensity from the overstory would affect understory tree species differently depending on each species inherent shade tolerance and may cause more substantial growth reduction and suppression in portions of stands where shade intolerant species are present. In addition to overstory competition, heavy, existing beargrass competition in many of the stands is an additional competitive factor in early stand development.

Precommercial thinning and fertilization of released understory plantations is prescribed following shelterwood overstory removal to ensure that stocking levels are within recommended levels and to enhance the growth of thinned trees (USDA 1984). Pruning of western white pine would reduce mortality from white pine blister rust.

Summary of Effects for Shelterwood overstory removal Unit Treatments

Alternative 1 and 3

No shelterwood overstory removal would occur. Retaining the current density of overstory would cause growth suppression of the understory.

Alternatives 2 and 4

These two alternatives include the same shelterwood overstory removal units and have the same effects. The changes from current stand conditions to those following treatment and projections into the future are shown in table 3-2 for an average stand. Immediately after treatment the number of trees per acre in the overstory would be substantially reduced along with the board feet per acre.

For the long term projection, thinned stands were regenerated in twenty years and allowed to grow for 100 years. One hundred years after the shelterwood overstory removal, the understory would have an average diameter of 12.6 inches, 2.7 inches larger than if no treatment was chosen. Understory volume in the treatment option would be 25 MBF/acre whereas if no treatment was performed, the volume would only be 9 MBF/acre. Unthinned stands had greater basal area and volume standing in 100 years but overall volume growth was greater on thinned stands when past harvest volume was added to the volume and basal area present at the end of the simulation. In other words, thinning these stands now would give the agency the option of capturing more volume through intermediate harvests as the stand develops vertical and horizontal species diversity.

Table 3-2 Short Term Changes—This Entry

	Post Treatment Trees/ac	Post Treatment DBH	Post Treatment Basal Area (sq ft)	Post Treatment MBF/Ac
Treatment	3	26.2	11	3
No Treatment	33	19.6	68	16

Table 3-3 Long Term Changes – Projected for 100 Years

	Over-story Trees/ ac	Under- story Trees/ac	Under- story DBH (in)	Total Stand Basal Area (sq ft)	Over- story Volume MBF/ac	Under- story Volume MBF/ac	Total Volume for 100 Yr Projection Standing +Harvested MBF/Ac
Treatment	3	197	12.6	170	5	25	41
No Treatment	18	207	9.9	188	16	9	25

With an initial overstory density of 33 trees per acre and 68 square feet of basal area, the no treatment scenario resulted in a 76% reduction in understory basal area at age 100. This is consistent with other findings. Acker and others (1998) found a 26 percent reduction in understory basal when an average overstory density of 5.2 trees per acre and 43 square feet of basal area was retained. Temesgen and others (2004) reported a reduction in understory growth of 8 to 43 percent when overstory density was 8.6 to 52 square feet per acre.

Some damage may occur to the understory from shelterwood overstory removal but can be minimized through careful falling and yarding. Replanting of poorly stocked areas may be needed but should amount to less than ten percent of the affected units. These stands have a fully stocked understory that would require thinning. Fuel treatment was completed during the original shelterwood entry and therefore no substantial damage from additional treatment is anticipated.

Completing the shelterwood overstory removal treatments would provide growth release for 633 acres of understory plantations and provide about seven million board feet of timber to the local economy.

Commercial Thinnings and Post & Pole

The Upper North Santiam Watershed Analysis (USDA 1995) recommends thinning stands to achieve stocking levels for optimum growth or for purposes of maintaining stands for longer periods. Stands considered for commercial thinning under this proposal are older than those addressed in the Willamette National Forest Plan (USDA 1994) and in yield table modeling (USDA 1984). Generally stands of this type area slated for regeneration harvest once they reach 95 years of age. Longer rotations can be considered to meet other resource needs or if stands have not yet reached 95 percent of CMAI. Substantial regeneration harvesting during the 1980's

and 1990's within the project area and impacts of that recent harvesting on wildlife and watershed resources also limits the extent of new regeneration harvesting until those 10-20 year old plantations grow sufficiently to lessen the impacts on other resources. Williamson (1984) and Curtis (1995), both reported increased growth responses from Douglas-fir thinning stands ranging from 90 to 117 years old without losing long-term timber production and Curtis noted that stands had not clearly reached CMAI. Previous harvest entries have lowered average stand density to some degree with the effect of delaying CMAI in nearly all stands proposed for thinning. Research in Douglas-fir shows thinning older stands that have not reached CMAI can yield increased growth responses (Williamson 1984 and Curtis 1995).

Commercial thinning treatments would reduce tree density by removing smaller diameter, poorer growing trees and many of those affected by insects or disease pathogens. Trees that remain following treatment would generally experience increased diameter growth, and would be better able to maintain or increase the amount of live crown relative to the height of the tree (live crown ratio). Tree vigor would be increased and lead to reduced mortality from insects and diseases. The removal of densely spaced, small diameter trees, in conjunction with fuels treatment, can reduce the severity of future wildfires. Canopy closure would be reduced following thinning and would permit increased sunlight to reach the forest floor. Increased sunlight would accelerate understory growth and development of a second canopy layer, creating vertical diversity.

Summary of Effects – Commercial Thinning Treatments

Alternative 1

No commercial thinning would occur. Stands would remain dense and with increasing mortality and growth loss from insects and disease and would be less resistant to damage from wildfires.

Alternatives 2 and 3

These alternatives would have the same effect as a result of commercial thinning and would meet the purpose and need for improving the health and vigor by thinning 633 acres to recommended density guidelines. Approximately nine million board feet of timber would be made available for the local economy.

Thinning from below coupled with fuel treatment would remove most ladder fuels and excess down material from these stands. Thinning would reduce future mortality by improving overall tree vigor and resistance to insects and diseases. Creation of logging slash can increase short term fire risk, however planned fuels treatment and the development of larger diameter trees with lower limbs farther above the ground have shown to reduce fire severity and improve tree survival (Graham and others 1999), (Agee and Skinner 2005). Most of the current ladder fuels in these stands are thin bark species such as mountain hemlock, silver fir and lodgepole pine and are easily killed by even moderate severity fires (Burns and others 1990). Thinning would favor larger diameter thicker barked species such as Douglas-fir which are more resistant to wildfires.

Of the 633 acres proposed for thinning, all but 25 acres have experienced past salvage logging in one or more entries in during the 1960's and 1970's. In some stands, selected species were removed and in others most of the larger old-growth has been removed. The impact on these stands was highly variable and has resulted in highly variable stand conditions. In the medium density stands there are substantial portions that have high density clumps that are in need of thinning. Individual stand exam plots in the medium density stands varied from a low relative density of .28 to a high relative density of .91. Medium density stands would also benefit from removal of trees susceptible to insect and diseases, and low vigor trees resulting from long-term growth suppression. The low density stands being proposed for treatment contain dense clumps and have the highest incidence of low vigor trees, especially lodgepole pine. Low density stands that were more heavily salvage logged have varying degrees of logging damage.

Western spruce budworm defoliation and the potential for increased risks to wildfire were identified in the Upper North Santiam Watershed Analysis as potential risks to the development of stands in this area. The Presley's Twin Timber sale was proposed, in part, to improve the health of stands to improve resistance to future outbreaks. Single-storied stands, created as a result of thinning, have been shown to be more resistant to insect attacks resulting in lower rates of mortality (Halloin 2003). Outbreaks prior to the 1980-90's infestation have been documented (Dolph 1980). Subsequent insect infestations would occur if no action is taken, given the species and stand structures present.

Post & pole harvesting would thin denser clumps of trees, and remove trees damaged by insects and diseases. Volume removal per acre is expected to be low, estimated in the range of 1 to 5 MBF per acre.

Alternative 4

Shelterwood overstory removal and regeneration treatments would be completed. No commercial thinning would occur. Stands would remain dense and with increasing mortality and growth loss from insects and disease and would be less resistant to damage from wildfires.

Shelterwood Creation and Regeneration with Reserves

Alternatives 1 and 3

Regeneration and shelterwood creation would not occur under these alternatives. Stands in question would continue to harbor phellinus root rot and dwarf mistletoe. Stand growth would be comparably slower than would be experienced with treatment.

Alternative 2 and 4

These alternatives would be composed of regeneration and shelterwood harvest on 55 acres and would improve the long-term health and vigor of the sites treated. Approximately 550 thousand board feet of timber would be made available to the local economy from these harvests.

Shelterwood harvests were prescribed primarily due to reduce losses from insects and disease, especially dwarf mistletoe. Just over half of the trees are infected with mistletoe. These stands were previously entered during the 1970's at which time most of the old-growth was removed along with portions of the younger age classes. These units have reached 95% culmination of mean annual increment (USDA FSH 2409.13 1992).

With shelterwood harvesting, the largest, healthiest trees would be retained to provide for frost protection. Concentrations of fuels generated by harvest activities would be treated as specified in tables 3-10, 3-11 and 3-12. Units would be replanted with a mixture of local species and with additional species regenerating naturally. The overstory would be scheduled for removal approximately ten years following the shelterwood harvest to reduce competition with planted understory trees.

Regeneration harvests would reduce current and projected losses from dwarf mistletoe, insects and suppression induced mortality. Comparing regeneration of these stands to no treatment yielded the results in 3-4.

Table 3-4 Comparison of Regeneration and No Treatment Alternatives

	DBH (inches)	Trees Per Acre	Basal Area (sq ft)	Total Volume for 100 Yr Projection (Standing +Harvested MBF/Ac)
Regeneration Harvest	12.1	218	175	53
No Treatment	19.8	89	184	40

Stand structural stage would change from the stem exclusion to stand re-initiation. Creation of these openings would provide a favorable site for re-establishment of western white pine which has been in decline due to white pine blister rust. These treatments would provide opportunities for other early seral vegetation species to develop that do not thrive under either closed canopy or partially shaded conditions.

3.2.8 Stand Diversity – All Treatment Types

Stand diversity would be enhanced by promoting diversity of species, size, structural stage and density within the project area. Approximately 2200 acres of stands were surveyed for potential silvicultural treatments for the project. In the maximum treatment alternative, 550 acres would receive no treatment. In regeneration harvest units, a variety of tree species would be planted and additional trees would regenerate naturally. Shelterwood overstory removal with pre-commercial thinning and fertilization of existing plantations would permit these stands to accelerate growth at a faster rate which would increase tree height, diameter and canopy closure. In commercial thinning stands, a range of densities have been prescribed. The proportion of each

tree species in thinning stands would be changed by treatment but all native species would be retained. Non-tree vegetation may decline or increase due to changes in canopy closure, soil moisture, soil disturbance and other factors.

3.2.9 Vegetation Cumulative Effects

Vegetation – Cumulative Effects – Alternative 1

Without completion of the proposed project, there would be no post sale resource enhancement projects. Since these are the only past, present or reasonably foreseeable future actions that would contribute to cumulative effects; the cumulative effects for alternative 1 would be the same as the direct and indirect effects described for vegetation in alternative 1.

Vegetation – Cumulative Effects – Alternatives 2, 3, & 4

The project area was used for the silviculture cumulative effects analysis. Past management actions that have the potential to affect current vegetation are timber harvest, road construction, and timber stand improvement treatments. Past timber harvest and post harvest silvicultural activities outside of the project area have little effect on development of the stands analyzed for treatment within the project area. These past vegetation activities are summarized in section 3.1.2 of this document.

Fifty-five acres of regeneration and shelterwood creation cutting would change stem exclusion stage to the stands initiation stage.

The foreseeable future actions that may contribute to cumulative effects include planting of regeneration and shelterwood creation units, aerial fertilization and pre-commercial thinning. These activities, along with the commercial thinning and final shelterwood overstory removal will increase diameter and height growth in developing understory trees. Planting of regeneration and shelterwood removal units along with the removal of overstory and co-dominant trees will open the forest floor to more sunlight and provide growing space for forbs, brush species and the developing understory. Pre-commercial thinning along with final shelterwood removal prescriptions would increase growing space, light and nutrient availability for the developing understory. The future thinning of the existing understory in the shelterwood removal stands and fertilization would accelerate the growth rates of trees in those stands. Aerial fertilization coupled with increased growth rates resulting from thinning and pre-commercial thinning treatments would increase both height and diameter growth. Aerial fertilization would also produce larger, darker boughs, especially in true fir species.

3.2.10 Vegetation Conclusion and Rationale

Stands identified for treatment under this proposal would respond with increased growth of the residual trees and would experience lower mortality levels from insects and diseases. The

severity of future wildfires in commercial thinning units would be reduced by removing ladder fuels, increasing tree spacing, increasing stand diameter by leaving larger diameter dominant trees and through treatment of hazardous fuels. Improving the health and vigor of stands prescribed for thinning would result in stands that are more resilient to damaging agents and would allow a wider array of stand management options in the future. Shelterwood overstory removal treatments, pre-commercial thinning, fertilization and white pine pruning would allow stands to attain growth rates more consistent with Forest Plan objectives and accelerate the development of larger diameter stands that are desirable to meet other non-timber resource objectives. Regeneration treatments would replace disease infected, poor vigor stands with healthy, mixed species plantations that are able to attain Forest Plan growth and yield objectives.

The silvicultural methods proposed for this project have been prescribed and successfully implemented in stand structures, plant associations and site conditions similar to those found in the Presley's Twin area. Monitoring of past treatments, including stand exams, reforestation stocking surveys, pre-commercial thinning exams, timber sale contract inspections, and other site visits, have verified that these treatments can be successfully implemented in compliance with Forest Plan Standards and Guidelines.

3.3 Fire and Fuels

3.3.1 Introduction – Fire and Fuel

The need for fuel reduction treatments is based on the fact that fine fuels are created during tree harvesting operations. Treatments would be done to reduce the majority of fine fuel loads to 7-11 tons per acre (the desired condition according to Willamette Plan Standards and Guidelines). Thinning of stands and the subsequent fuel reduction treatments would have the additional benefit of lowering the risk of large wildfires in the project area.

The analysis was done to predict post-harvest fine fuel loads in the project area and to analyze the potential effects of treating those fine fuels. Post harvest fuel load predictions were obtained using digital photos/ocular methods. Direct, indirect and cumulative effects were analyzed using a combination of fire and fuels modeling/assessment tools (see Section VI). Recommended fuel treatments in the action alternatives would reduce fine fuels to forest standards in 84% - 100% of the project area, depending on the chosen alternative. The analysis shows that reducing stand density and treating fine fuels would improve stand conditions and reduce the long-term risk potential of larger more intense wildfires. The analysis also shows that fire was historically a natural part of the Presley's Twin project area and the Willamette National Forest ecosystem as a whole.

One recent study (Thompson, et. al, 2007), suggests salvage logging and subsequent planting after a wildfire may increase fire severity despite removal of large woody fuels. The Presley's Twin sale does not propose any activities in either of the recent B&B or Puzzle fire areas. Additionally no salvage logging has occurred or is anticipated in either fire area west of the Cascade crest.

3.3.2 Regulatory Framework –Fire and Fuel

- Northwest Oregon Fire Management Plan

3.3.3 Analysis Methods – Fire and Fuels

The following is a list of analysis methods and their uses

- BeHave by Remsoft: software predicting a range of factors related to fire behavior.
- Fire Regime Condition Class (FRCC): framework for evaluation/quantification of stand health relative to historic conditions.
- Fire Behavior Prediction System Fuel Models (FBPS): standardized fuel models for predicting fire behavior characteristics.
- First order Fire Effects Model (FOFEM): software for predicting a range of fire effects, including mortality and smoke emissions.
- Fuels Management Analyst Suite (FMAPlus): for evaluation, quantification and prediction of the Effects of a range of fuel treatment activities.
- Geographic Information Systems (GIS): mapping/evaluation of spatial characteristics of fire and fuels information/data.

3.3.4 Desired Future Condition –Fire and Fuel

The Willamette National Forest plan Standards and Guidelines has established desired conditions for fine fuel loads on forest lands (7-11 tons/acre for 0-3” fuels). In addition, Fire Regime Condition Class (FRCC) assessment provides a framework for understanding the overall health of forested stands relative to their historical condition. The desired future condition for treated stands in the project area is Condition Class 1, which is defined by the following statement: within the range of natural/historical variability of vegetation characteristics, fuel composition, fire frequency, fire severity, and associated disturbances.

3.3.5 Existing Condition –Fire and Fuel

Fire History

Fire records from 1970-2006 indicate that approximately 16 fires were reported and suppressed within the project area. Approximately 25 fires were adjacent to the project area. The reported causes were lightning and human starts.

Table 3-5 Large Fires in and around the Project Area Since 1943

Fire Name	Year	Acres
Rockpile Fire	1998	124
B&B Fire	2003	90,769
Puzzle Fire	2006	6,340

All other fire starts since 1943-present were less than one-tenth of an acre. The project area has typically experienced slightly less than one fire per year since 1970 (Sources: Willamette NF fire records and GIS).

Timber Harvest and Fire

From 1960-present, timber harvest has replaced fire as the dominant disturbance within the project area. Fifty percent of the acres harvested between the years 1986 and 1994 were harvested using a shelterwood prescription. A majority of these units were broadcast burned to deal with the activity generated fuels. Timber sales included Pioneer (1986), Turp (1987), and Santiam 90 (1991-1994). Stands are between 190 to 92 years of age (average 150 years). Only about 20% of the area was pre-commercially thinned between 1984 and 2003.

Currently, un-thinned natural stands in the project area are typically made of dense stands with a large dead/down woody component. For fire purposes large downed wood could be anything over 3 inches but generally also includes larger material. This definition is different than the definition of large wood for wildlife purposes, which includes only pieces larger than 18 inches. These stands pose the largest threat in terms of fire danger potential. The shelterwood and the final shelterwood overstory removal stands pose less of a threat due to post harvest treatments of underburning and broadcast burning that occurred after the first harvest entry. Many of these burns were done at the high end of the prescription and the larger diameter down and woody (3-9"+) were consumed. At present time the forest understory is comprised of bear grass, huckleberry, rhododendron, vine maple and bracken fern (Sources: Willamette NF GIS and field observations).

Fire Regime

Fire regime designations are a method to estimate how often we would expect to see natural fire on the landscape in the absence of human intervention. The project area is made up of three fire regime classes: 45 percent of the project area is a high-severity regime with a fire return interval of 200-400 years, 40 percent is a mixed severity regime with a fire return interval of 100-200 years and 15 percent is a mixed severity with a fire return interval of 50-100 years.

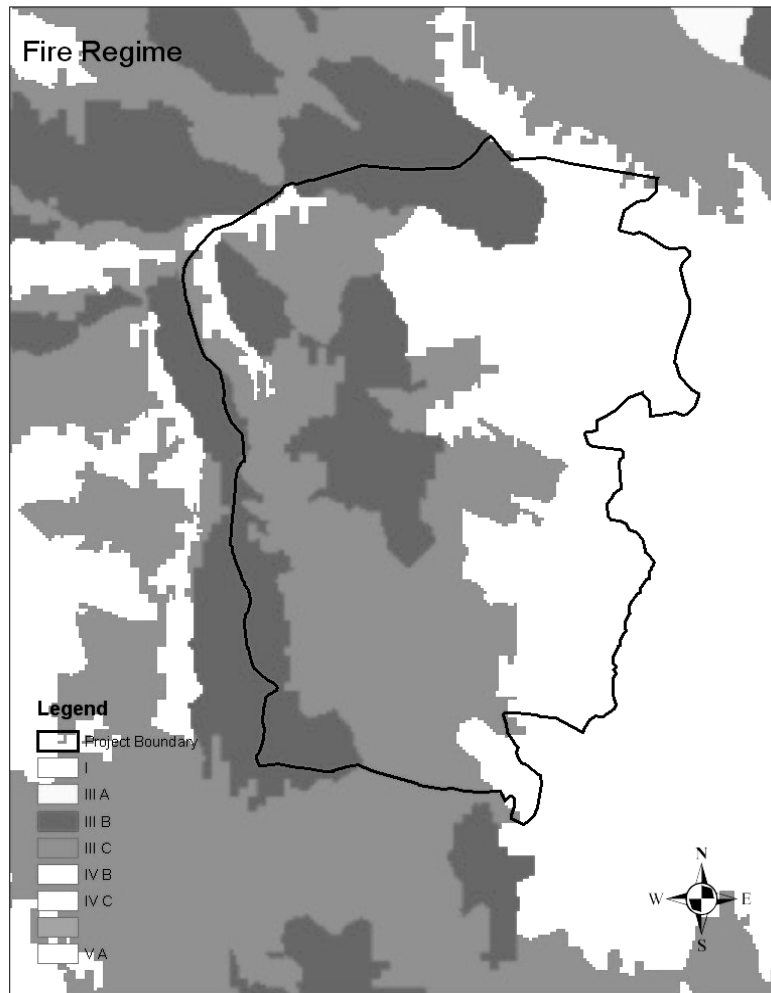


Figure 3-6 Fire Regimes in the Project Area

Field observations have shown that the mountain hemlock stands in this area are influenced by factors that affect mortality fires susceptibility. These stands are infected with mistletoe, have a high mortality rate with low canopy closure and lots of brush. These stands typically have a higher fire frequency of less severe fires than other similar mountain hemlock stands. Stands also have much more fuel than would be found under reference condition.

Today the vast majority of fires are suppressed before they can spread, consume fuels and thin out overgrown stands. When fire is immediately suppressed, a fire-return interval is interrupted or skipped, causing forest fuel conditions to gradually accumulate over time (FRCC Guidebook, INFMS and field observations).

Condition Class

Condition class is a classification of the amount of departure from the natural fire regime. Condition classes have been defined as within (1), moderate departure from (2) and high departure from (3) the natural/historical variability of vegetation characteristics, fuel composition, fire frequency, fire severity, and associated disturbances. Based on fuels inventories, 90% of the planned harvest acres are condition class 1 and about 10% of the proposed harvest acres are condition class 2. Table 3-6 shows definitions for the three different condition classes.

Table 3-6 Fire Regime Condition Class Definitions

Condition Class	Departure of Fire Regime from Historic Range	Risk of Losing Key Ecosystem Components	Alteration of Vegetation Attributes from Historic Range
1	Departure is not more than one return interval	Low	Functioning within the historic range
2	Moderate change in size and intensity has resulted	Moderate	Moderately altered
3	Dramatic changes in fire size and severity have resulted	Severe	Substantially Altered

The project area has three fuel models, timber with light litter (8), timber with heavy dead and downed (10) and timber with understory brush (5) mixed with timber with light litter (8).

**** This portion of the project area is actually composed of a combination of fuel models 5 and 8 and may display some characteristics of both.**

Table 3-7 Fuel Models in Project Area

Fuel Model #	Description	Fire Behavior	% Project Area
8	timber with light litter	<ul style="list-style-type: none"> • Slow burning ground fire with low flame • Hazardous only under severe weather conditions involving high temperatures, low humidity's, and high winds 	70%
10	timber with heavy dead and downed material	<ul style="list-style-type: none"> • Closed conifer stands • Fire spreads primarily through litter and light fuels on the forest floor with a substantial component of dead fuel • Greater intensity than fuel model 8. • May develop into crown fires, with substantial mortality when hot, dry and windy conditions persist. 	20%
5	timber with understory brush	<ul style="list-style-type: none"> • Carried in the surface fuels • Generally not very intense because surface fuel loads are light and foliage has little dead and volatile material 	10% **

GIS fuels mapping done for the Willamette National Forest can help illustrate how fuels exist in a mosaic across a landscape. Landscape fuel mapping is done at a coarse scale and is not as accurate as observations in the field. However, figure 3-7 does give an indication of how fuel models exist in a mosaic in the project area (Fuel modeling sources: GTR-INT-122, Willamette NF GIS and field observations).

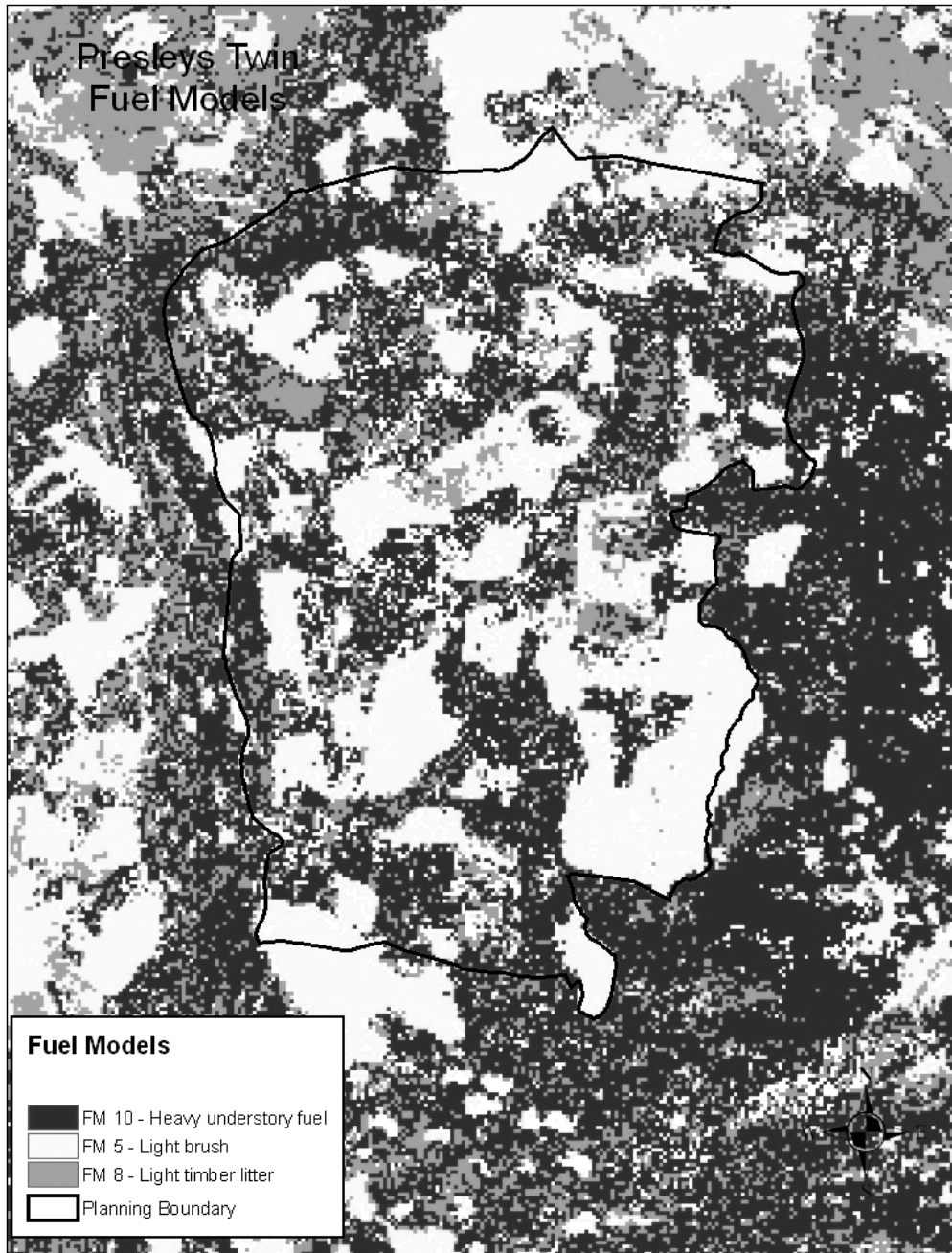


Figure 3-7 Fuel Models in the Project Area

Fuel Loading

Surface fuel loads were determined by completing random transects in the project area using digital photo series applications (FMA Plus) and visual estimation. In some cases, surface fuel loads from surveyed stands have been used to model nearby stands with similar characteristics.

Table 3-8 Presley's Twin Existing Surface Fuel Loading Estimates

Unit Numbers	0-3" Fuel Load (tons/acre)*	>3" Fuel Load (tons/acre)	Total Fuel Load (tons/acre)
1-15, 161,17-30,411,61,63	4-5	10-20	14-25
16,34,41-44,46-49,50-56,561,57,59,60,62,64	3-5	13-20	16-25

* For the purpose of the Presley's Twin analysis, 0-3" fuels may also be referred to as fine fuels and >3" fuels may be referred to as coarse woody fuels.

It is well documented that coarse woody fuels have little influence on the spread and intensity of initiating surface fires (Brown et al, 4). Fine fuels are required for fires to spread and gain the intensity needed to ignite heavier fuels. Harvest activities primarily generate fine fuels and create relatively small amounts of coarse woody fuels. Coarse woody requirements for wildlife are addressed in section 3.5.2.

3.3.6 Environmental Consequences – Fire and Fuel

Table 3-9 helps describe potential wildfire behavior in the project area stands under late summer conditions. The information in this table applies to all alternatives. Fuel model 12 represents forests with moderate amounts of untreated slash on the ground. Fuels models 8/5 and 10 represent current fuel models. Under alternative 2, all stands would become fuel model 8/5 after recommended treatment. Under alternatives 3&4, approximately 22% of the project area could remain as a fuel model 12 for 6-10 years and return to a fuel model 8/5 thereafter.

Table 3-9 Potential Fire Behavior in Late Summer Conditions (source: BEHAVE)

Fuel Models*	Flame Lengths (ft)	Rate of Spread (ft/hr)	Size of Fire After 1 Hour (acres)
8/5	2.9	7.4	2.8
10	4.2	5.0	1.4
12	7.2	9.6	4.9

Fuel model 12 represents forests with moderate amounts of untreated slash on the ground. Fuel models 8/5 and 10 represent current fuel models. Under alternative 2, all stands will become fuel model 8/5 after recommended treatment. Under alternatives 3&4, about 22% of the project area could remain as a fuel model 12 for 6-10 years and return to a fuel model 8/5 thereafter.

Direct and Indirect Effects – Fire and Fuel – Alternative 1

Under alternative 1, no fuels would be generated from harvest activity and forested stands would continue on a path of natural succession. However, modern fire suppression policies would continue to dictate fire exclusion from the project area. A lack of substantial disturbance would mean that stands that were previously managed would continue growing into an overstocked condition. Slow growing and weakened trees would die and contribute to the fuel build-up on the forest floor. Condition Class 1 stands would progress towards condition class 2 and 3. Over time, the increasing fuel loads could be associated with greater fire intensity, severity and rates of spread. Fire occurrence on the landscape would continue only under uncontrolled wildfire situations.

Direct and Indirect Effects – Fire and Fuel – Alternatives 2, 3 & 4

The proposed commercial thinning, shelterwood overstory removal and shelterwoods in the Presley's Twin project area would open the stands. As a result of this opening of the stand, large overstory trees would be less susceptible to crown fires. By opening the stand and increasing sun exposure to the developing understory, these stands may become drier and burn more readily than if the overstory trees remained in the unit. These effects will be minimal as shelterwood overstory trees are relatively widely spaced already and the incremental increase of sunlight delivered to the understory will be small.

Ladder fuels would be reduced as harvest operations remove the vertical fuel continuity. Because heavily thinned stands would have fewer residual trees and more crown spacing, these stands would be less susceptible to crown fires than moderately thinned stands. The proposed treatments for the action alternatives include grapple piling/burning, broadcast and underburning.

The amount of harvest-related slash remaining in a unit depends primarily on the pre-existing surface fuel load and the number of trees to be harvested. In the Presley's Twin project area, stands that have been previously thinned would require harvest of fewer trees than stands that have never been thinned (assuming similar prescriptions). As a consequence, harvest

generated slash would generally be heavier in previously unthinned units. In addition, previously unthinned stands in the project area generally have heavier pre-existing surface fuel loadings. This is true because there are more crowns to shed needles/twigs/branches, and because unthinned stands tend to have more dead and dying trees.

Direct and Indirect Effects – Fire and Fuel – Alternative 2

Under alternative 2, grapple piling and burning would occur on 412 acres within the unit and along designated roads. All units with harvest activities would have landing piles burned following harvest. The additional treatments of prescribed burning by either underburning or broadcast burning would occur on 81 acres. As a result of these treatments, residual fuel loadings in approximately 78% of the project area would be within forest Standards and Guidelines for 0-3” fuels. Fuel loadings in approximately 22% of the project area could be above forest and guidelines for several years. Alternative biomass utilization may occur if a market exists.

Increased surface fuel loads affect fire behavior by temporarily increasing fire intensity and rate of spread. The increase in fuel loading is temporary because moderate to heavy precipitation in the western Cascades Mountains accelerates the decomposition processes, especially for fine fuels. As a result, fire danger in an untreated stand would be highest 1-5 years after thinning and would decrease substantially thereafter. Studies done by Fahnestock and Dieterich have shown that Douglas fir slash decomposes to approximately 79% of its original volume after 5 years. Field observations on the Willamette have indicated that Douglas-fir and Western hemlock slash decomposes to approximately 50% of its original volume after 10 years; observations have found that less than 10% of residual slash remains after 20 years. This indicates that all harvest units in the Presley's Twin area would be within Willamette National Forest Standards and Guidelines for 0-3” fuels after 10 years. Because fire spread is primarily driven by 0-3” fuels, Standards and Guidelines for 0-3” fuels are used to determine when slash loadings are above acceptable levels.

Table 3-10 Alternative 2 Fuel Treatment Information

Unit Number	Recommended Fuels Treatment	Approximate % Area Treated	Approximate Acres Treated
1,40,41,42,44,46,47,49,50,54,57,59,60,62	GP&B	27%	412
2-15,161, 17-30,43,53,61,63,64	PB	67%	357
45,411,491	BCB	3%	40
55,56,561	UB	3%	41
TOTAL	N/A	100%	892

GP&B=grapple pile& burning, PB=machine & landing pile burning, BCB=broadcast burn, UB=under burn

Prescribed fire would take place during conditions that mimic spring-like conditions or when weather and fuels are in spring-like conditions. Spring conditions are: Fuels 3” and greater

in diameter (1000 hour fuels) would have fuel moistures of 25% or greater, soil moistures and duff moistures would be damp, at levels where duff consumption would be limited to duff retention objectives or less across the unit, and mortality of overstory trees would be low.

Direct and Indirect Effects – Fire and Fuel – Alternative 3

Under alternative 3, 378 acres would be grapple piled and burned. The additional treatment of prescribed underburning and broadcast burning would occur on 44 acres. As a result of these treatments, residual fuel loadings in approximately 89% of the project area would be treated to levels within Willamette National Forest Standards and Guidelines for 0-3” fuel loading. The additional 11% would remain above Standards and Guidelines for 6-10 years while residual slash decomposes. Alternative biomass utilization would occur if the market exists for wood fiber or firewood. Table 3-11 shows a summary of treatments for alternative 3.

Table 3-11 Alternative 3 Fuel Treatment Information

Unit Number	Recommended Fuel Treatment	Approximate Percentage of Project Area	Approximate Acres treated
41,42,44,46,47,49,50,54 57,59,60,62	GP&B	67%	378
53,63,64	PB	25%	42
55,56,561	UB	7%	41
TOTAL	N/A	100%	561

GP&B=grapple pile& burning, PB=machine & landing pile burning, BCB=broadcast burn, UB=under burn

Direct and Indirect Effects – Fire and Fuel – Alternative 4

Under alternative 4, grapple piling and burning would occur on 33 acres. Additional treatments of prescribed broadcast burning would occur on 40 acres. The majority of acres treated for activity generated fuels in this alternative fall under pile burning (139 acres). Field observations and inventories showed that these managed stands were broadcast burned after harvest during the first entry. Fuel loadings were shown to be below Standards and Guidelines for 0-3” fuels. There were minimal amounts of 3-9”+ fuels as well. The need to treat these stands for anything other than burning landings would not be necessary. Post harvest fuels would be light and would be left on site to replenish depleted soils and nutrient loss due to prior fuels treatments.

In summary, approximately 51% of the project area would be treated to levels within the Willamette National Forest Standards and Guidelines for 0-3” fuel loading. The remaining 49% would be at or below Standards and Guidelines while any residual slash decomposes. Table 3-12 shows a summary of treatments for alternative 4.

Table 3-12 Alternative 4 Fuel Treatment Information

Unit Number	Recommended Fuel Treatment	Approximate Percentage of Project Area	Approximate Acres treated
1,40	GP&B	7%	33
2-15,161,17-30,61	PB	84%	380
45,411,491	BCB	9%	40
TOTAL	N/A	100%	453

GP&B=grapple pile& burning, PB=machine & landing pile burning, BCB=broadcast burn, UB=under burn

3.3.7 Cumulative Effects

Cumulative Effects – Fire and Fuel – Alternative 1

Under the no action alternative, stands would continue on a path of natural succession. Because there has been active timber management in the project area during the past 50 years, many stands, especially those stands proposed for final shelterwood removal, in the project area currently meet or are close to forest plan standards and guidelines for fuel loading.

Approximately 25 fire starts have been recorded in or immediately adjacent to the 6,142 acre project area during the era of modern fire suppression (1943- present). Approximately 87% of these fires were contained at one-tenth of an acre or less. Within the last 4 years the B&B and the Puzzle fire escaped initial attack and burned 16,817 acres on the Willamette NF. During the pre-suppression era, natural fires in the project area would have burned at least 18,512 acres during the same number of years. This estimate is based upon a natural fire return interval of 200-300 years, although the actual fire return interval is probably closer to 150 years (Source; INFMS Fire Regime Mapping). The cumulative effects of fire exclusion during the modern era of fire suppression are well-documented and have been observed in fire prone ecosystems throughout the American West (RMRS-GTR-42 vol. 5, p. 185-203).

As already noted, fire suppression practices during the past 50 years have caused the greatest cumulative effects with regard to fuels in the project area. Past timber management of the Presley Twin project area has been a secondary factor influencing cumulative effects on the forest fuel loadings. This has resulted in surface fuel loads and crown densities that are generally low-moderate in about 53% of the planned harvest area; these areas are represented mostly by fuel model 5 and 8. Surface and crown fuel loads in approximately 47% of the planned harvest area are generally heavy, and are mostly represented by a fuel model 10. Since 1970, several timber sales have had a secondary benefit of mitigating the cumulative effects of fire suppression by reducing stand densities on more than 1668 acres within the 6,142 acre Presley Twin area.

Past timber harvests that have occurred within the Presley Twin project area have included Pioneer, Turp and Santiam 90.

Due to the cumulative effects of fire suppression, the build-up of fuels in previously unthinned stands would become a more substantial problem over the next 50 years. Increasing stand density and the accumulation of fuels would inevitably lead to a wildfire that is much more difficult to control than a fire in a thinned stand. Condition class would continue to advance toward higher classes until future treatments are accomplished or a stand destroying wildfire occurs. Without treatment, many of these stands may move from a condition class one to a condition class two. A severe, large wildfire may not occur in the project area for 50 years or more, but natural combinations of weather and fuel conditions would ensure that it would happen eventually.

Cumulative Effects—Fire and Fuel –Alternative 2, 3 & 4

Harvests that would occur as a result of the Presley Twin planning effort would include thinning approximately 633 acres of the project area that have not been previously thinned. Approximately one-third of forested stands within the project area have never been managed. Surface and crown fuel densities in these stands are similar to unthinned stands within the planned Presley Twin harvest area. A wildfire in these stands has the potential to become larger and cause more tree mortality than a fire in thinned stands. With proposed fuel treatments, areas that currently have low fuel loadings are expected to be within forest Standards and Guidelines after treatments are completed. From a fire danger perspective, this means that post-treatment fire risk in these areas would be typical of other healthy stands found on the Willamette National Forest. Thinning would produce the secondary benefit of long-term resistance to crown fire development and stand destroying fires in the project area. Main roads and spur roads within the project area where residual fuels have been thoroughly removed would serve as access points for firefighters and fuel breaks to reduce continuity of remaining slash. Condition class would improve and stabilize due to lower crown density and lighter fuel loads, especially as residual slash decomposes (sources: GTR-INT-122, Willamette NF GIS timber sale data, and field observations).

Precommercial thinning, a proposed post sale resource enhancement project would result in a short period of increased fuel loading as a result of cutting small diameter trees and leaving them on site. Recent field studies in the area of small diameter woody debris decay on the Detroit Ranger District suggests 85% of all fine woody material would decay within 10 years (McDevitt, 2004). It should be noted that this study focused on commercial thinning – rather than pre-commercial thinning – which may produce a different fuel profile.

Cumulative Effects—Fire and Fuel –Alternative 2 & 3

In those areas that currently have heavy fuel loads, post-treatment fuel loads would be treated to mitigate the hazards. From a fuels perspective, main road and spur road clean-up of residual slash would result in fuel breaks that separate concentrations of fuels. These fuel breaks would

provide access and routes of attack for initial attack firefighters in the event a wildfire occurs in the area. Commercial thinning in the project area would have the secondary benefit of mitigating the cumulative effects of fire exclusion, and condition class would stabilize or be improved in all stands. As earlier noted, the majority of the 6,142 acre project area has never been thinned and would continue on a path of succession that is being unnaturally impacted by fire exclusion.

Cumulative Effects—Fire and Fuel –Alternative 4

Fuels on all acres of the planned harvest areas would be reduced within or below forest Standards and Guidelines. The recommended treatments would virtually eliminate the potential for uncharacteristic fire danger that sometimes results from the presence of residual logging slash. These treatments would greatly reduce the chances of stand destroying fires occurring within the next 50 years.

3.3.8 Fuels Treatment Costs

Table 3-13 represents total costs for fuel treatments for the action alternatives.

Table 3-13 Treatment Cost Totals*

Alt.	Broadcast Burn	Under Burn	Grapple Pile Burning	Burning piles	Total cost
1	0	0	0	0	0
2	\$24,000	\$28,700	\$61,800	\$16,660	\$131,160
3	N/A	\$28,700	\$43,650	\$7790	\$80,140
4	\$24,000	N/A	\$18,300	\$8890	\$51,190

*Under Burn (\$700/acre), Broadcast Burn (\$600/ac),
Grapple pile Burning (150/acre), Burning Piles (\$50/acre)

3.3.9 Slash Storage/Disposal for Action Alternatives

Tops and limbs may be yarded (attached) in some units to landing areas and would be made into piles at those locations. Yarding tops and limbs could generate 2-3 tons of slash per acre logged. For this reason, landings for those units would be planned so as to accommodate the potential for large volumes of slash. Machine piles may be created at any landing area and along any roads adjacent to units within the project area. Machine piles should be piled in haystack fashion, meaning that the heights of the piles are approximately equal to their widths. Care should be taken to make piles so as to minimize damage to standing trees during the burning phase. Machine piles would be burned during the fall/winter.

3.4 Air Quality

3.4.1 Regulatory Framework – Air Quality

- 1990 Clean Air Act and the 1977 Clean Air Act and its amendments
- Smoke Management Plan

3.4.2 Existing Condition – Air Quality

The Oregon Smoke Management Plan establishes designated areas that are principal population centers and Class I airsheds, including wildernesses and other sensitive airsheds. One purpose of the Smoke Management Plan is to protect air quality in these high priority areas. The closest Class I airsheds are the Mt Jefferson wilderness 2 miles to the east and the Mt Washington wilderness 12 miles to the south.

3.4.3 Environmental Consequences – Air Quality

Direct and Indirect Effects – Air Quality – Alternative 1

There would be no immediate impacts to air quality as a result of the no action alternative. However, the stands would continue to store biomass as they grow and postpone the release of smoke. Eventually a large fire would occur during summer months when fuels are the driest, resulting in high fuel consumption and large amounts of smoke. Smoke from such wildfire could blanket Sisters, Bend DA, and Detroit or one of the nearby wildernesses. This would amount to a substantial, increase in particulate matter and effect air quality and visibility in the affected area. The most likely time for a large wildfire to occur is between July 1 through September 15, coinciding with outdoor recreation activities and high public use of the wilderness. A wildfire burning about 1668 acres in late summer conditions would produce 667 tons of particulate matter of 2.5 microns and 834 tons of particulate matter of 10 microns for a total of 1501 tons of particulate matter released into the air. Table 3-14 shows the relationship among alternatives and particulate matter released into the air.

Direct and Indirect Effects – Air Quality – Alternative 2

Air quality in the designated areas could be affected by fuel treatments that include pile burning, broadcast and underburning. Fuel treatment associated with alternative 2 would produce 684 tons of particulate matter of 2.5 microns and 410 tons of particulate matter of 10 microns for a total of 1085 tons. These figures are based on burning approximately 1439 acres of machine piles (landing and grapple piles) & approximately 41 acres of underburning & 40 acres of broadcast burning.

Direct and Indirect Effects – Air Quality – Alternative 3

Air quality in the designated areas could be affected by fuel treatments that include pile burning, broadcast and underburning. Fuel treatment associated with alternative 2 would produce 160 tons of particulate matter of 2.5 microns and 187 tons of particulate matter of 10 microns for a total of 347 tons. These figures are based on burning approximately 633 acres of machine piles (landing & grapple piles) & underburning 41 acres.

Direct and Indirect Effects – Air Quality – Alternative 4

Air quality in the designated areas could be affected by fuel treatments that include pile burning, broadcast and underburning. Fuel treatment associated with alternative 2 would produce 183 tons of particulate matter of 2.5 microns and 427 tons of particulate matter of 10 microns for a total of 610 tons. These figures are based on burning approximately 849 acres of machine piles (landing & grapple piles) & broadcast burning 40 acres.

Table 3-14 Project Area Burning Emissions Estimates (tons)

Emission Type	Alt. 2*	Alt. 3**	Alt. 4+	Wildfire ++
PM 2.5	684	160	183	667
PM 10	401	187	427	834
PM Totals	1085	347	610	1501

*Based on burning approximately 1439 acres of machine piles (landing and grapple piles) & approximately 41 acres of underburning & 40 acres of broadcast burning.

**Based on burning approximately 633 acres of machine piles (landing & grapple piles) & underburning 41 acres.

+ Based on burning approximately 849 acres of machine piles (landing & grapple piles) & broadcast burning 40 acres.

++Based on wildfire burning on approximately 1668 acres, late summer conditions.

Prescribed pile burning would occur during fall and winter months according to limitations established by Oregon Smoke Management System forecaster. Any broadcast or underburning would typically happen in the spring during spring-like conditions or when weather and fuels are in spring-like conditions. By adhering to the smoke management daily forecast, smoke impacts on sensitive areas should be negligible (Source: Oregon Smoke Management Emissions Estimates).

3.4.4 Cumulative Effects

Cumulative Effects – Air Quality – Alternative 1

The build-up of fuels represents a threat of the uncontrolled release of large amounts of emissions in the event of a wildfire. As noted earlier, fire exclusion has exacerbated the build-up of fuels in the project area and has made the potential for a large wildfire more likely the longer

the forests go unthinned. While there is no evidence to suggest such a release of pollutants would be of any harm to general air quality, it is clear such an event could have substantial impacts on air quality to sensitive areas.

Cumulative Effects – Air Quality – Alternative 2, 3 & 4

No long term, cumulative effects on air quality are anticipated due to burning associated with this project. All burning would be completed within 2 years of harvest, and would create far fewer emissions than a wildfire occurring in an area of equivalent size. In order to protect air quality, the Oregon Smoke Management instructions would be strictly adhered to. The Santiam River Zone (Detroit Sweet and Home Ranger Districts) fire and fuels fire management strategy for prescribed burning is to avoid large, uncontrolled releases of smoke that are produced during large wildfires. By burning slash fuels in one timber sale area at a time, residual fuels are treated gradually and in a controlled manner. For this reason, emissions from prescribed burning are not greater than emissions caused by natural wildfires. The Santiam River Zone currently burns 700 acres of logging slash per year. Fire history records for the district from 1970-2001 indicate that wildfires burned 3611 acres on district lands or an average of 120 acres per year. Natural fire return intervals on most of the 490,000 acre Santiam River Zone are 100-200 years (INFMS mapping). If we assume (as the established fire regimes suggest) that all lands on the district burn at least once every 200 years, we can determine that the historical (pre-suppression era) average annual acres burned was 2540 acres (490,000 divided by 200- see FRCC Guidebook) In other words, natural wildfires that occurred prior to the modern fire suppression era created a higher quantity of pollutants than are created by prescribed burning on the district today.

3.5 Wildlife

3.5.1 Big Game

Regulatory Framework – Big Game

Management objectives for deer and elk habitat apply to specific mapped “Big Game Emphasis Areas” (BGEA) within the Willamette National Forest. Each emphasis area has been assigned a rating of high, moderate, or low with habitat effectiveness values defined for each rating.

Habitat effectiveness objectives are defined for each habitat type which includes cover quality; forage quality; open roads; and size and spacing of cover and forage areas. A Model to Evaluate Elk Habitat in Western Oregon (Wisdom, 1986) is used to measure cumulative effects of habitat alteration west of the Cascade Mountains crest. This model will be referred to as the HEIWEST model throughout this section. Minimum desired habitat values are given in the Willamette Forest Plan at FW-147, FW-151, and FW-153 and are shown in Table 3-15, below for high and moderate emphasis areas.

Changes in management practices altered how we achieve habitat effectiveness values. Clearcuts followed by slash burning are no longer the primary harvest method. Clearcut harvest creates much higher forage values than thinning and other types of harvest strategies.

Analysis Methods – Big Game

The analysis area considered for effects to big game habitat for the Presley's Twin project is composed of the Marion and Upper North Santiam Big Game Emphasis Areas (BGEAs).

Existing Condition – Big Game

The management objectives for big game habitat are applied to specific mapped "Emphasis Areas" within the Forest. Forest Plan Standards and Guidelines (S&G) (FW-137) directs the use HEIWEST to model the effects of projects on habitat within BGEAs. The HEIWEST model is used to estimate habitat effectiveness, which is defined as the proportion of achievement relative to an optimum condition. The management intent is to maintain effectiveness value in the range of 0.5-1.0 with the optimum value being 1.0. HE incorporates and qualifies four key habitat attributes: size and spacing of forage (HEs), quality of forage (HEf), cover areas (HEc), and open road density (HEr) through big game habitat. Each habitat variable is calculated individually and allows for a comparison by variable or as a whole (known as the Habitat Effectiveness Index or HEI).

The HEIWEST model considers past and ongoing activities. Recent studies suggest forage quality during summer and autumn periods may be more important than thermal cover in the winter for reproductive success and survival than previously assumed (Cook et. al., 1998, 2005). This research involved controlled studies where elk were given sufficient amounts of forage during the winter season but hiding cover was restricted. The resulting conclusions showed that forage may limit health and survival more than hiding or thermal cover during winter. Forage levels in the Presley's Twin area are at minimum desired values for both BGEAs (Table 3-15).

Both BGEAs are moderate emphasis areas with winter range. Winter range is managed for high emphasis habitat values which equates to a minimum desired rating of .5 for each variable with an overall value of .6. Winter range overlaps only 1 acre of one unit of the proposed project so would not be analyzed further. A moderate emphasis area should possess an HEI between 0.4 and 1.0 for each habitat value with 1.0 being optimum and less than 0.4 being marginal. The overall HEI for a moderate emphasis area should be greater than 0.5. Table 3-15 describes the current index values for the BGEAs in the Presley's Twin Project Area.

Table 3-15 Current Big Game Emphasis Area Habitat Values

Big Game Emphasis Area	Spacing (HEs)	Cover (HEc)	Forage (HEf)	Roads (HEr)	Overall (HEI)
Marion					
Moderate Emphasis	.78	.59	.40	.56	.57
Minimum Desired Rating	.40	.40	.40	.40	.50
Upper North Santiam					
Moderate Emphasis	.49	.53	.40	.66	.51
Minimum Desired Rating	.40	.40	.40	.40	.50

Many road closure devices placed in the area as a result of previous projects are in bad condition and, in many cases, no longer function to limit vehicular access. The public uses these roads, even though they were designated to be closed. Portions of the roads behind run-down gates currently used by four wheel drive enthusiasts were treated as though they are open in the HEIWEST modeling for this project. An interdisciplinary open road analysis, Big Meadows Open Road Area Analysis Project Environmental Assessment, covering the project area, was completed in August 1991. A CFR closure notice was signed on December 18, 1992. At this time the 1991 E.A. is the most recent signed decision on open road management in the area.

Large fires east of the project area, in the Mt. Jefferson wilderness, have converted thousands of acres into foraging habitat. Hiding, thermal and optimal thermal cover was eliminated in many burned areas. This high elevation area will gradually become a mixture of forage and hiding cover. Foraging habitat in general forest, outside the wilderness, will continue to experience reductions by being converted to hiding and then thermal habitat over time. Burned areas have some hiding cover value present in the form of standing snags. Forage quality in summer range has been greatly increased by recent fires in the wilderness which reduces the need for forage enhancement in adjacent summer range outside the wilderness.

Direct and Indirect Effects – Big Game – Alternative 1

Thinning

There would be no thinning under this alternative.

Final Shelterwood Removal, Shelterwood Creation, Regeneration Harvest

There would be no regeneration harvest to promote forage production under this alternative.

Roads

There would be no roads proposed for new closures with this alternative. HEIWEST Model results for the direct and indirect effects of alternative 1 would be the same as the existing condition. Miles of open road within the BGEAs would remain the same as shown for the

existing condition. Current habitat effectiveness values are at or above minimum Forest Plan desired levels for the project area.

Direct and Indirect Effects – Big Game – Alternative 2

Thinning

May provide additional forage for a few years until the canopy closes in thinning units and allow for seeding of disturbed areas for additional forage production. Thinning would result in slightly better forage values as more sunlight would reach forage species on the forest floor.

The most noticeable effect from thinning will be from the removal of hiding cover over a large area adjacent to large fires which also removed hiding, thermal and optimal thermal habitat. The proposed deferred harvest corridor running north to south and the riparian leave corridors running east to west would improve hiding cover by providing a network of undisturbed hiding and travel pathways in the project area. The corridors are located away from roads, where possible; to further reduce the effect of road traffic on big game use of the project area. Forest plan S&G habitat effectiveness levels are being met prior to harvest activity.

Big Game Winter Range

The project is not occurring in big game winter range, except for approximately one acre in unit two. Haul routes do pass through winter range to the west on road 2261 for approximately ½ mile and 2257 north of the project for approximately 2 ¼ miles. The area of winter range accessed by the 2257 haul route is heavily used by big game during the winter. Forest Plan Standards and Guidelines suggest, “seasonal restrictions should be considered for activities such as road construction and timber harvest when they occur in...key wintering areas” (Forest Plan, IV-68).

In an effort to protect big game winter range, snow plowing for vehicular access would be prohibited from the junction of the 2257 and 2261 roads north along the 2257 road. All mitigation measures are depicted in table 2-6. This restriction would limit vehicular access to big game winter range during periods when animals are concentrated and movement away from disturbance is difficult due to deep snow conditions. Limiting vehicular access would reduce disturbance to big game and promote conditions that would improve health, reproductive success and survival rates. Limiting vehicular access would also reduce opportunities for poaching where animals are concentrated and movement is limited.

Final Shelterwood Removal, Shelterwood Creation, Regeneration Harvest

Little, if any, change in habitat type or value is anticipated in final shelterwood removal units. Shelterwood removal units will basically remain unchanged in terms of big game forage values as they currently receive sufficient sunlight for forage species. Very few large overstory trees will be removed from these units.

Roads

The effects resulting from road management would be the same as those described in alternative 1.

Direct and Indirect Effects – Big Game – Alternative 3

Direct and indirect effects of this alternative are the same as those effects described under the thinning and roads heading in alternative 2.

Direct and Indirect Effects – Big Game – Alternative 4

Direct and indirect effects of this alternative are the same as those effects described under the Final Shelterwood Removal, Shelterwood Creation, Regeneration Harvest heading and the Roads heading in alternative 2.

Cumulative Effects – Big Game

The cumulative effects analysis is also defined by the big game emphasis areas. Past, present, and foreseeable actions were considered in the analysis and model during the mapping of habitat conditions. Past management practices increased forage in the area which was low in forage and resulted in increases in big game populations. Over time forage value has decreased as trees planted in the previously harvested areas have grown and are crowding out forage species.

The cumulative effects on the BGEAs in the project area are expected to be inconsequential. Shelterwood removal will cause little if any change in habitat type or value. Thinning may provide additional forage for a few years until the trees grow larger and return to closed canopy conditions. The addition to forage value is so slight it is not expected to be reflected in model results.

If gate and berm structures were reestablished as a result of proposed post sale resource enhancement projects, this could improve habitat for deer and elk by limiting motorized access in areas that have been effectively open to traffic since old gates and berms have fallen down. This, in conjunction with the seeding and forage creation proposed as a result of this project would have a positive overall cumulative effect on big game habitat in the Presley's Twin area. Section 3.1 describes all past, present and reasonably foreseeable future actions.

3.5.2 Snags***Introduction – Snags***

The Willamette Forest Plan directs snag habitat to be managed at levels capable of providing for at least 40% or greater potential populations of cavity-nesting species.

DecAID represents a new approach to addressing the habitat components of snags and downed woody debris. DecAID is the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon (Mellen et al. 2006).

DecAID is a web-based advisory tool to help land managers assess impacts of forest conditions and existing or proposed management activities on organisms that use snags and down wood. It is a summary, synthesis, and integration of published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience. DecAID does not model biological potential or population viability. Furthermore, there exists no direct relationship between tolerances, snag densities and sizes used in DecAID and the measurements of population levels.

Analysis Methods – Snags

There are two analysis methods used to inform decisions as to how many trees should be left for snags in the project area. A snag model tied to a forest geographic information system layer of vegetation types was used to calculate current conditions in planning subdrainages affected by the project and for determining compliance with Willamette Forest Plan and Northwest Forest Plan Standards and Guidelines. The NWFP, as amended, requires retention of snags at levels sufficient to support cavity-nesting birds at 40 percent potential population levels. More detailed definitions can be reviewed in the Willamette Forest Plan (WNF Plan, pp.IV-65, 66). Habitat shall be provided and monitored at the subdrainage level (p.IV-65).

DecAID is the second tool, used to suggest treatment level snag densities relative to landscape levels. One objective of the DecAID model is to mimic natural conditions across the landscape, generally defined as 20 square miles. Not all areas of all units would have the same number of snags; they may be clumped or scattered, large or small. Another objective is to provide guidance for management of snags to meet wildlife needs. “DecAID presents wildlife data at three tolerance intervals (30%, 50% and 80%) for each species, which the user can interpret as increasing levels of assurance of providing for species” (Marcot, Holmann and Mellen, in prep). DecAID also presents snag information based on inventory data. The user can choose which set of data, wildlife or inventory, best applies to a given project.

Existing Condition— Snags

Table 3-16 shows planning subdrainages and existing snag levels. Percent snags in the table refers to the Willamette Forest plan requirement that all planning subdrainages supply snags at a level which provides for 40% of the potential population level of cavity nesting species. The project area is in the Marion and Upper North Santiam planning subdrainages.

For the Montane Mixed Conifer forest type, data on wildlife use of snags is limited to two species, American Marten and Fisher in Wyoming. DecAID information can be interpreted based on tolerance levels. 80% of the landscape in the Montane Mixed Conifer forest type would have snag densities of at least 26 snags per acre (>10” DBH) and 14 snags per acre (>19.7” DBH). Table 3-17 shows this relationship.

Table 3-16 Planning Subdrainages and Existing Snag Levels

Planning Subdrainages*	Potential population level for cavity Nesting Species
79D Marion	50%
79E Upper North Santiam	60%

***The area covered by planning subdrainages is different from the area covered by sub-watersheds for the Presley's Twin Project.**

The two recent wildfires significantly affected the number and distribution of snags in the two planning sub-drainages. Between the B&B and Puzzle fires, over 55% of the Marion planning sub-drainage has been burned since 2003. 25% of the Upper North Santiam planning sub-drainage was burned in the 2003 B&B fire. The Puzzle fire did not burn in this planning sub-drainage. These burned areas are providing standing hard snags at levels well above the 80% tolerance level because all or most of the remaining trees are standing dead.

The Marion and Upper North Santiam planning sub-drainages are providing snags at levels well above the 80% tolerance level for the Montane mixed conifer large tree forest type. The level of snags described in this inventory analysis represents the existing condition on unmanaged stands in this forest type and can be thought of as a desired future condition. Table 3-17 shows the number of snags needed on a percentage of the landscape which can also be thought of as a tolerance level for corresponding wildlife data.

Table 3-17 Reference Conditions of Snag Levels Occurring on a Percent of the Landscape

% Landscape (Tolerance Level)	# Snags Needed >10" DBH (Trees/Acre)	# Snags Needed >19.7" DBH (Trees/Acre)
30%	11	6
50%	15	8
80%	26	14

***Information interpreted from tables MMC_L.inv-2 and MMC_L.inv-3 DecaID Advisor**

Direct and Indirect Effects— Snags—Alternative 1

Existing levels of downed woody material would be maintained. Snags in existing shelterwood units would slowly die as a result of natural mortality and produce more snags. This natural mortality would be delayed as a result of reduced competition from previous harvests and would produce fewer snags than would be expected from unmanaged stands.

In the near future there will not be manmade snags as part of any timber sales and there would be no losses of snags for safety or operational reasons as a result of harvest activities. In the future snags would be created naturally at a much slower rate than if they were created manually by topping as described in the action alternatives. Natural snag creation rates should exceed natural downed woody debris creation rates. It is estimated that more snags would remain standing than would fall for downed woody debris in the near future. Essentially there would be no change in the near future in the number of snags per acre on these units.

Direct and Indirect Effects— Snags—Alternative 2

Shelterwood Overstory Removal, Shelterwood Creation, Regeneration

Shelterwood overstory removal harvests, shelterwood creation and regeneration harvests will occur in stands which have trees large enough to create snags of 18" dbh or larger. Between 1 and 4 trees per acre would be left after harvest to meet forest plan Standards and Guidelines for snags. The majority of shelterwood removal treatments are old units from a shelterwood creation sale that occurred in the early 1990s. Wildlife tree clumps were left in most of these units and trees were topped to meet forest plan Standards and Guidelines. Units 11, 12 & 30 (shelterwood overstory removal units) are expected to retain some live residual old-growth trees which will provide snag characteristics after harvest. The specific units that were designed in alternative 2 meet Forest Plan Standards and Guidelines for snags.

Commercial Thinning, Post and Pole Harvests

As a result of thinning, trees of a larger diameter will become available for snags in a shorter period of time. In stands proposed for thinning, stagnation in growth has occurred in these overstocked stands and stress from overstocking is resulting in disease/insects causing extensive mortality, generating snags. With treatment, the average diameter of the stand will be increased by removing the smaller trees and the remaining trees will grow faster. Thinning harvest units are not expected to have snags of the size required (18"+) for the forest plan. The specific units that were designed in alternative 2 meet Forest Plan Standards and Guidelines for snags because there is no requirement to leave snags in commercial thinning.

Direct and Indirect Effects— Snags—Alternative 3

Direct and indirect effects are the same as the thinning portion of alternative 2.

The specific units that were designed in alternative 3 meet Forest Plan Standards and Guidelines for snags.

Direct and Indirect Effects— Snags—Alternative 4

Direct and indirect effects are the same as the Shelterwood Overstory, Shelterwood Creation, and Regeneration portion of alternative 2. The specific units that were designed in alternative 4 meet Forest Plan Standards and Guidelines for snags.

Cumulative Effects— Snags

The area analyzed for cumulative effects was the Presley's Twin project area which is in the Marion and Upper North Santiam subdrainages.

The scale of analysis for DecAID and the Willamette Forest Plan snag model describe conditions at the planning sub-drainage level. At this spatial extent, snag analysis takes into account the recent B&B and Puzzle fires. Recently burned areas have extremely high levels of snags. The potential for snag creation and or loss as a result of the Presley's Twin project would occur on roughly 6100 acres which fall mostly in the Upper North Santiam planning sub-drainage. Changes to snags as a result of this sale would not alter the existing tolerance level of 80% for either planning sub-drainage.

Within the project area snags would be maintained at current levels once harvest and mitigations are completed. Stands that were part of previous shelterwood creation units, meet Forest Plan Standards and Guides for snag habitat. Presley's Twin would maintain the current snag levels in proposed final shelterwood removal units.

Salvage logging and routine hazard tree felling along roads would continue to reduce snag levels in areas where these activities occur. Thinning in managed stands in the future would increase average tree diameter and produce larger snags sooner than in unmanaged stands.

Clearcut harvest units from approximately 1940-1980 did not leave wildlife trees. In 50-70 years after harvest these stands would begin to produce trees large enough to provide snags of 18-20" dbh. Natural recruitment in unmanaged stands may take 20-30 years longer to produce the same size snags as thinning in managed stands. Stands harvested over the last 20 years have provided for wildlife tree habitat by leaving green trees in the units and topping them to create future snags as a measure to meet Forest Plan standards. Stands that have been previously managed are expected to mature, providing more snags resources in the project area than are currently available. Trees killed by large fires in 2003 & 2006 would decay and become down wood as time passes. This would reduce the number of snags per acre in these areas and increase the levels of down wood. The quality of snags in the project area would increase as areas burned by fire provide snags and managed stands grow larger snags more quickly than unmanaged stands.

3.5.3 Downed Wood

A renewable supply of large down logs is critical for maintaining populations of fungi, arthropods, bryophytes and various other organisms that use this habitat structure. Provision of coarse woody debris is also a key standard and guideline for American marten, fisher, two amphibians, and two species of vascular plants. These animals need coarse woody debris well distributed across the landscape that provides for ecological functions.

Regulatory Framework—Downed Wood

- Northwest Forest Plan

- DecAID Tool
- Willamette Forest Plan

To meet Forest Plan Standards and Guidelines for downed woody debris, at least 240 linear feet of logs per acre greater than or equal to 20 inches in diameter and greater than 20 feet in length must be supplied. It is the down wood in decay classes I and II that are to be counted. The down wood species to be left should be a reflection of the species mix found in the original stand.

The DecAID tool can also be used to analyze downed woody debris needs. DecAID presents downed woody debris information based on inventory data.

Analysis Methods – Downed Wood

There are two analysis methods used to inform decisions as to how many trees should be left for downed woody debris in the project area. To comply with Willamette Forest Plan and Northwest Forest Plan Standards and Guidelines, 240 linear feet per acre of at least 20 inch diameter and 20 feet in length downed woody debris must be provided. Downed woody debris should be provided and monitored at the harvest unit level. More detailed definitions can be reviewed in the Northwest Forest Plan (p. C-40).

DecAID is the second tool, used to analyze natural reference conditions for downed woody debris at the landscape level. One objective of the DecAID model is to mimic natural conditions across the landscape, generally defined as 20 square miles. Another objective is to provide guidance for management of snags to meet wildlife needs. DecAID presents downed woody debris information based on inventory data.

Existing Condition—Downed Wood

In previously harvested units trees were not felled to provide downed wood and as a result levels of downed woody debris are very low. Trees were topped to create snags in most of these units and the tops are providing some downed wood. Some trees have blown down in a few units and are providing downed woody material. Most units proposed for thinning have patches of small snags and downed wood as a result of insect killed trees.

Size of trees available in proposed thinning and post and pole units for down woody debris is currently too small and does not meet size requirements of the Northwest Forest Plan. In some stands proposed for regeneration harvests trees are over 20" dbh. In natural stands that re-grew after fire killed the stand, trees are small because growth has been retarded under high density conditions. Some areas have high levels of smaller diameter snags due to extensive insect caused mortality in the past 10-15 years. Table 3-18 shows the percentages of the two planning subdrainages in the project area that are providing sufficient large snags and percentages of these areas where trees are too small to meet minimum size requirements.

Table 3-18 Planning Subdrainages and Existing Downed Woody Debris (DWD) Levels

Planning Subdrainage*	Area Provides Sufficient DWD (%)	Area Where Trees are too Small to Meet DWD Size Requirements (%)	Burned by Wildfires Since 2003 (% Area)
Marion	48	52	38
Upper North Santiam	35	65	18

***The area covered by planning subdrainages is different from the area covered by sub-watersheds for the Presley's Twin Project.**

Downed woody debris levels are well above the 80% level in these planning subdrainages due to thousands of acres of trees which were killed in recent fires. For the Montane Mixed Conifer forest type, data on wildlife use of downed woody debris is limited to three species, Fisher, Southern Red-Backed Vole and Three-Toed Woodpecker. For this reason, inventory data was used instead of species data. DecAID information can be interpreted based on tolerance levels. 80% of the landscape in the Montane Mixed Conifer forest type would have downed woody debris densities of at least 10% cover (>4.9" DBH). Table 3-19 shows this relationship.

Table 3-19 Reference Conditions of Downed Woody Debris Levels Occurring on a Percent of the Landscape

% Landscape (Tolerance Level)	% Cover DWD >4.9" Needed
30	3
50	5
80	10

Data from MMC_L.inv-10 DecAID Tool

Down wood percent cover has not been estimated directly in the project area. However, recent fires have burned large areas of these sub drainages (see table 3-18). In following years, decay will cause most of the current snags to fall and become downed woody material in the burned areas. Fire mortality in the project area will provide levels of downed wood in excess of those recommended in DecAID.

Direct and Indirect Effects—Downed Wood – Alternative 1

Existing levels of downed woody material would be maintained. Snags in existing shelterwood units would continue to fall and produce more down woody material. Live overstory trees in existing shelterwood units are expected to remain healthy as a result of reduced competition from previous harvests and would produce less downed woody debris than would be expected from unmanaged stands. Contributions of downed woody material from the understory would continue from small diameter trees dying as a result of competition. These trees are generally larger than 5" in diameter and would contribute toward increasing the % cover over time.

Direct and Indirect Effects—Downed Wood – Alternative 2***Commercial Thinning and Post and Pole Harvest***

The increased diameter of down wood in the future as a result of thinning would provide better quality down wood. Units proposed for regeneration harvest are currently providing downed woody material of a diameter sufficient to meet minimum diameter requirements in most units. Recruitment of larger down wood is expected to occur for several decades from naturally occurring and created snags falling from decay. Because this action is not a final removal, and downed woody debris diameters are not large enough to meet Forest Plan minimum diameters there is no Forest Plan requirement to meet downed woody debris levels for thinning treatments.

Shelterwood Overstory Removal, Shelterwood Creation and Regeneration Harvests

Regeneration harvest would result in downed woody material being left or live trees felled to meet Forest Plan S&G levels. Units proposed for regeneration harvest are currently providing downed woody material of a diameter sufficient to meet minimum diameter requirements in most units. Recruitment of larger down wood is expected to occur for several decades from naturally occurring and created snags falling from decay. Regeneration harvest would result in downed woody material being left or live trees felled to meet Forest Plan S&G levels.

Direct and Indirect Effects—Downed Wood – Alternative 3

Effects are the same as those described under commercial thinning and post and pole harvest in alternative 2.

Direct and Indirect Effects—Downed Wood – Alternative 4

Effects are the same as those described under shelterwood overstory removal, shelterwood creation and regeneration harvests in alternative 2.

Cumulative Effects—Downed Wood

Salvage logging and routine hazard tree felling along roads would continue to reduce snag levels in areas where these activities occur. Firewood cutting along roadways open to the public reduces down wood levels adjacent to roads. Thinning in managed stands in the future would

increase average tree diameter and produce snags of larger diameter sooner than in unmanaged stands.

Clearcut harvest units from approximately 1940-1980 did not leave wildlife trees. In 50-70 years after harvest these stands would begin to produce trees large enough to provide snags of 18-20" dbh. Natural recruitment in unmanaged stands may take 20-30 years longer to produce the same size snags as thinning in managed stands. Stands harvested over the last 20 years have provided for wildlife tree habitat by leaving green trees in the units and topping them to create future snags as a measure to meet Forest Plan standards. Stands that have been previously managed are expected to mature, providing more snags resources in the project area than are currently available. The future increase in acres providing snags, and managed stands providing larger snags earlier than unmanaged stands, would increase the availability and quality of snags in the project area.

Suppression of wildfires which historically were stand replacing fires has resulted in increases of down wood accumulations across the landscape. Underburning in low intensity fire areas has not occurred as a result of fire suppression creating more fuel for fires than were historically present.

Trees killed by large fires in 2003 & 2006 would decay and become down wood as time passes. This would reduce the number of snags per acre in these areas and increase the levels of down wood.

Private land in the project area is expected to have a downward trend in providing DWD. Past and current harvest practices on private land, which is generally clearcut and burn, generally lack wildlife trees or down wood after the harvest.

Downed woody debris percent cover is currently being provided at the 80% tolerance level. Changes as a result of activities on private land, and the Presley's Twin project would not alter the tolerance level of downed woody debris. The area would continue to provide downed woody debris at the 80% tolerance level.

3.5.4 Migratory Birds

Regulatory Framework—Migratory Birds

- 1918 Migratory Bird Treaty Act

Existing Condition—Migratory Birds

Forested habitats may contain warblers, swallows, swifts and other migratory species. Most of the habitat in the Presley's Twin watershed is coniferous forest. Riparian habitat associated forest types are generally not present in the project area as the elevation is relatively high, the soils are well drained and dry and most runoff is subsurface rather than in streams.

Direct and Indirect Effects—Migratory Birds – Alternative 1

Species using forested habitats and densities of migratory birds are not expected to change.

Direct and Indirect Effects—Migratory Birds – Alternative 2***Commercial Thinning and Post and Pole Harvest***

The number of trees removed as part of thinning would not be sufficient enough to change the habitat type or species patterns of use. Thinning units are expected to maintain the same type of habitat before and after harvest.

Shelterwood Overstory Removal, Shelterwood Creation and Regeneration Harvests

Regeneration harvest units would in the short term provide habitat for open/grass habitat specializing species. Over time these conditions would change back to forested habitat types. Final shelterwood overstory removal unit are expected to maintain the same habitat characteristics and species associated with open habitat. Shelterwood creation units would have a more open canopy and provide foraging and nesting habitat.

Direct and Indirect Effects—Migratory Birds – Alternative 3

Direct and indirect effects are the same as the thinning portion of alternative 2.

Direct and Indirect Effects—Migratory Birds – Alternative 4

Direct and indirect effects are the same as the Shelterwood Overstory, Shelterwood Creation, and Regeneration portion of alternative 2.

Cumulative Effects—Migratory Birds

Regeneration and shelterwood creation units are the only prescriptions that would change the species composition from those that prefer closed-canopy forested environments to those that prefer open-canopy forested environments. This shift in species abundance will be insignificant.

Regeneration harvest units are preferred by birds specializing in open habitat environments. The project area is dominated by non-riparian forested habitats. Regeneration harvest units would provide a mix of open habitats distributed among the dominant forested habitats. The larger landscape provides a mix and distribution of habitat types important to migratory land bird species. Stand changes provide a mix of structure and seral type conditions which provides habitat for a mix of migratory land bird species.

3.5.5 Raptors and Colonial Nesting Birds

Existing Condition – Raptors and Colonial Nesting Birds

Surveys were not conducted to identify raptor or colonial nesting birds. If large trees or snags are being used by raptors and colonial nesting birds it is expected that these trees would be retained as wildlife trees or snags. The largest trees available are retained as wildlife trees or snags and these are the ones which may be used by raptors or colonial nesting birds.

Colonial nesting birds are not expected to occur in the harvest units. Raptors may nest and forage in the proposed units, and may be disturbed.

Direct and Indirect Effects – Raptors and Colonial Nesting Birds – Alternative 1

Active roost and nest sites for raptors and colonial nesting birds would not be disturbed.

Direct and Indirect Effects – Raptors and Colonial Nesting Birds – Alternative 2

No active roost and nest sites for raptors and colonial nesting birds have been identified in the sale area. If active roost and nest sites are identified during harvest activities they would be protected and seasonal restriction zones established at that time to meet Forest Plan Standards and Guidelines.

Direct and Indirect Effects – Raptors and Colonial Nesting Birds – Alternative 3

Thinning would promote development of larger trees which, over time, would serve as better nest sites than if trees were left unthinned. Un-thinned trees would generally be smaller and provide less desirable nesting habitat. Effects as a result of alternative 3 are the same as those described in alternative 2.

Direct and Indirect Effects – Raptors and Colonial Nesting Birds – Alternative 4

In final shelterwood overstory removal units, snags will be created at the rate of 3.3 per acre. This level of snag creation will meet the habitat needs of raptors and colonial nesting birds. Many of these units have existing wildlife clumps from previous harvests. These trees will provide both dead and live trees for raptors and colonial nesting birds.

Cumulative Effects – Raptors and Colonial Nesting Birds

There are no past, present or reasonably foreseeable cumulative effects related to raptors and colonial nesting birds in the project area.

3.5.6 Management Indicator Species

Management indicator species include the Spotted Owl, Bald Eagle, Deer, Elk, Peregrine Falcon, Pileated Woodpecker and Pine Marten. Resident fish are also a Management Indicator Species

see section 3.11 for fisheries information. These management indicator species are associated with late seral stages of forest development. As ecological indicators, these species which represent all animals which may be affected by limited amounts, distribution, and quality of mature and old-growth coniferous forests.

Spotted owl, Peregrine falcon and bald eagles are discussed in section 3.5.8 Threatened, Endangered, and Sensitive Species. Habitat for elk and deer is discussed under Big Game section 3.5.1. Habitat for elk and deer is discussed under Big Game section 3.5.1.

Existing Condition – American Marten

The Presley's Twin project area is composed of older timber, up to 190 years of age, however, stands in the Presley's Twin area do not generally provide characteristics associated with old-growth forests; and therefore are not prime habitat for American marten. Despite the lack of old-growth characteristics, the number and distribution of snags and downed wood that exists in these two planning sub-drainages is probably sufficient to provide for American marten at the 80% tolerance level if they were present in this area.

Direct and Indirect Effects – American Marten – Alternative 1

American marten habitat would not be changed as a result of alternative 1. These stands are not providing old-growth characteristics and most likely do not provide good habitat for American marten. There would be no potential noise disturbance as a result of harvest activities.

Direct and Indirect Effects – American Marten – Alternative 2

Effects to American marten are expected to be very minimal in this area which does not provide old-growth characteristics. No change in available snag densities is expected as a result of the Presley's Twin project (section 3.5.2). One or two American marten individuals may be disturbed as a result of noise and harvest activity but the actions are not likely to affect the American marten population as a whole. The level of snags and downed woody debris in this area meet forest plan standards and guides as well as the 80% tolerance level for American marten suggested by DecAID (MMC_S/L.sp-5, MMC_S/L.sp-7).

Direct and Indirect Effects – American Marten – Alternative 3

Effects to American Marten as a result of alternative 3 are the same as those in alternative 2.

Direct and Indirect Effects – American Marten – Alternative 4

Effects to American Marten as a result of alternative 4 are the same as those in alternative 2.

Existing Condition – Pileated Woodpecker

Like American marten, pileated woodpecker use forested areas with late seral characteristics. Stands in the Presley's Twin area do not generally provide characteristics associated with old-growth forests; and therefore are not prime habitat for pileated woodpecker. DecAID does not provide data for pileated woodpecker in the Mixed Conifer large tree forest type. The number and distribution of snags and downed wood that exists in these two planning sub-drainages is high and is probably not limiting to pileated woodpecker populations.

Direct and Indirect Effects – Pileated Woodpecker – Alternative 1

Pileated woodpecker habitat would not be changed as a result of alternative 1. These stands are not providing old-growth characteristics and most likely do not provide good habitat for pileated woodpecker. There would be no potential noise disturbance as a result of harvest activities.

Direct and Indirect Effects – Pileated Woodpecker – Alternative 2

Effects to pileated woodpecker are expected to be very minimal in this area which does not provide old-growth characteristics. No change in available snag densities is expected as a result of the Presley's Twin project (section 3.5.2). One or two pileated woodpecker individuals may be disturbed as a result of noise and harvest activity but the actions are not likely to affect the pileated woodpecker population as a whole. The level of snags and downed woody debris in this area meet forest plan standards and guides.

Direct and Indirect Effects – Pileated Woodpecker – Alternative 3

Effects to pileated woodpecker as a result of alternative 3 are the same as those in alternative 2.

Direct and Indirect Effects – Pileated Woodpecker – Alternative 4

Effects to pileated woodpecker as a result of alternative 4 are the same as those in alternative 2.

Cumulative Effects—Management Indicator Species

There are no effects associated with past, present and reasonably foreseeable activities in the project area that when added to the effects of the proposed actions are expected to result in cumulative effects.

3.5.7 Survey and Manage Species

Survey and manage species applicable to this project area include Great Gray Owl, Crater Lake Tightcoil and Red Tree Voles. Survey and manage standard and guideline will provide benefits to mammals, bryophytes, mollusks, vascular plants, fungi, lichens and arthropods. Late-seral and mature conifer habitat provides the feeding, resting, and breeding areas that are required by these species. The standard and guidelines contain four components, and priorities differ among

them. 1. Manage known sites. 2. Survey prior to ground-disturbing activities. 3. Extensive surveys. 4. General regional surveys.

Existing Condition—Great Gray Owl

Great gray owls tend to forage in meadows and other openings, including human created openings which contain important prey species. Their main prey items in the western U.S. are primarily voles and pocket gophers. Great grays nest in mature or old-growth conifer forests or forests with remnant older trees or snags. Nest stands typically have >60% canopy closure with an open understory.

Direct and Indirect Effects—Great Gray Owl—Alternative 1

There are no direct or indirect effects to great gray owls. The nearest suitable habitat to the project is 1.1 miles and outside the ¼ mile distance that trigger surveys. Surveys are not required for this project.

Direct and Indirect Effects—Great Gray Owl—Alternative 2

Effects to Great Gray Owls as a result of alternative 2 are the same as those stated in alternative 1 above.

Direct and Indirect Effects—Great Gray Owl—Alternative 3

Effects to Great Gray Owls as a result of alternative 3 are the same as those stated in alternative 1 above.

Direct and Indirect Effects—Great Gray Owl—Alternative 4

Effects to Great Gray Owls as a result of alternative 4 are the same as those stated in alternative 1 above.

Existing Condition – Red Tree Voles

Based on the literature, old-growth habitat appears to provide optimum conditions for red tree vole populations. The tall, multi-layered canopies of old-growth retain humidity and intercept fog, which functions as a climatic buffer and a source of free water. Large branches provide stable support for nests, protection from storms, and travel routes (Gillesberg and Carey 1991, as cited in the Survey Protocol for the Red Tree, Vole Version 2.1). Active nests have been found in remnant older trees in younger stands indicating the importance of legacy structural characteristics (Biswell pers. Comm. as cited in the Survey Protocol for the Red Tree, Vole Version 2.1). Little is known about the minimum number or size of conifer trees, or other stand characteristics, required to sustain a local population of red tree voles.

Red tree voles have been documented in conifer stands from sea level to 5,500 feet in elevation (Manning and Maguire 1999 as cited in the Survey Protocol for the Red Tree, Vole Version 2.1).

Direct and Indirect Effects –Red Tree Voles – Alternative 1

Potential habitat would not be disturbed.

Direct and Indirect Effects –Red Tree Voles – Alternative 2

In fall 2006, surveys were completed using regional Survey Protocol for the Red Tree Vole (Version 2). The likelihood of negative effects to the species is low in because surveys were done to protocol and no active or inactive nests were detected. This alternative complies with the management direction for this species.

Direct and Indirect Effects –Red Tree Voles – Alternative 3

Effects to Red Tree Voles as a result of alternative 3 are the same as those stated in alternative 2 above.

Direct and Indirect Effects –Red Tree Voles – Alternative 4

Effects to Red Tree Voles as a result of alternative 4 are the same as those stated in alternative 2 above.

Existing Condition – Crater Lake Tightcoil

The Crater Lake Tightcoil (*Pristilloma*) is expected to occur in perennial wet areas in forests. Mosses, hardwood logs, ferns and rushes within 10 meters of perennial wet areas are key features used by this mollusk. More detailed expected habitat requirements for these species can be found in the survey protocol (<http://www.or.blm.gov/surveyandmanage/>). This species of mollusk has not been located on Detroit Ranger District. Potential habitat does not occur in the treatment areas so no effects will occur to the species.

Direct and Indirect Effects – Crater Lake Tightcoil –Alternative 1

Potential habitat would not be disturbed.

Direct and Indirect Effects – Crater Lake Tightcoil –Alternative 2

This species requires surveys prior to ground-disturbing activities when habitat is present. Surveys were not conducted as perennial wet areas were removed from consideration by dropping portions of units in or adjacent to this habitat type. These areas were included in the no-disturbance corridors established to maintain connectivity of habitat for wildlife and botanical species in the project area. Potential habitat does not occur in the proposed project. Areas

adjacent to the project which may contain suitable habitat are protected by not disturbance buffers.

Direct and Indirect Effects – Crater Lake Tightcoil –Alternative 3

Effects to Crater Lake tightcoil as a result of alternative 3 are the same as those stated in alternative 2 above.

Direct and Indirect Effects – Crater Lake Tightcoil –Alternative 4

Effects to Crater Lake tightcoil as a result of alternative 4 are the same as those stated in alternative 2 above.

Cumulative Effects—Survey and Manage Species

There are no effects associated with past, present and reasonably foreseeable activities in the project area that when added to the effects of the proposed actions are expected to result in cumulative effects.

3.5.8 Proposed, Threatened, Endangered and Sensitive Species

Proposed, Threatened, Endangered and Sensitive Species which have habitat in the project area include Spotted Owls, Bald Eagles, Baird's Shrew, California Wolverine, Pacific Fisher, Pacific Fringe-Tailed Bat, Pacific Shrew, Oregon Slender Salamander.

Regulatory Framework– Proposed, Threatened, Endangered & Sensitive Species

- Pacific States Bald Eagle Recovery Plan, USFWS, 1984.
- Pacific Coast Recovery Plan for the American Peregrine Falcon, USFWS, 1982.
- Biological Assessment Supplement, Project Design Criteria: Protection Measures for Peregrine Falcons, R-6, USDA Forest Service, 1998.

Analysis Methods – Proposed, Threatened, Endangered and Sensitive Species

Analysis of impacts was done based on the process established in Section 2670 of the Forest Service Handbook and the R-6 Interim Direction R-6 2670-92-1. In addition to these and the following documents, personal knowledge of the area, professional judgment, and other studies were used to assess the risk of the proposed project adversely affecting Threatened, Endangered, or Sensitive Species.

Table 3-20, below, lists the proposed, threatened, endangered and sensitive species on the Willamette National Forest (USDA Forest Service, 2004). Additional detailed information about these species is in the Biological Evaluation for Wildlife in Appendix B.

Table 3-20 Status and Habitat Presence of Threatened, Endangered and Sensitive Species

Species	Habitat Present in Project Area?	Status		
		Federal	Region 6 (USFS)	State
American peregrine falcon	No	N/A	Sensitive	Endangered
Black swift	No	N/A	Sensitive	Peripheral or naturally rare
Bufflehead	No	N/A	Sensitive	Undetermined
Harlequin duck	No	Candidate	Sensitive	Undetermined
Northern bald eagle	Yes	Sensitive	N/A	Threatened
Northern spotted owl	Yes	Threatened	N/A	Threatened
Baird's shrew	Yes	N/A	Sensitive	N/A
California wolverine	Yes	Candidate	Sensitive	Threatened
Pacific fringe-tailed bat	Yes	N/A	Sensitive	Vulnerable
Pacific Fisher	Yes	Candidate	Sensitive	Critical
Pacific shrew	Yes	N/A	Sensitive	N/A
Cascade torrent salamander	No	N/A	Sensitive	Vulnerable
Foothill yellow-legged frog	No	N/A	Sensitive	Vulnerable
Northwestern pond turtle	No	N/A	Sensitive	Critical
Oregon slender salamander	Yes	N/A	Sensitive	Undetermined
Oregon spotted frog	No	N/A	Sensitive	Critical
Crater Lake tightcoil	No	N/A	Sensitive	N/A
Mardon skipper	No	Candidate	Sensitive	None
Yellow Rail	No	N/A	Sensitive	

The following species have no habitat in the project/analysis area and will not be discussed further in this document – American Peregrine Falcon, Black Swift, Bufflehead, Cascade Torrent Salamander, Crater Lake Tight-coil Snail (habitat buffered out of project), Harlequin Duck, Foothill Yellow-Legged Frog, Northwestern Pond Turtle, Oregon Spotted Frog, Yellow Rail and Mardon Skipper.

Spotted owls will be discussed separately after other proposed threatened, endangered and sensitive species.

Existing Condition – Proposed, Threatened, Endangered and Sensitive Species

The Endangered Species Act (ESA), administered by the U.S. Fish and Wildlife Service (USFWS), mandates protection of threatened and endangered species. Listed species are typically habitat specific with narrow geographic and environmental distributions. Proposed threatened, endangered and sensitive species (PETS) have specific requirements under the ESA and Willamette Forest Plan to maintain viability. Protection includes managing habitats to minimize impacts, as well as prohibition of noise disturbance during the breeding season. Consultation is required with USFWS on activities that may affect these species or their habitat.

Table 3-20 lists the PETS wildlife species on the Willamette National Forest and whether there is potential habitat in the project area. Additional detailed information can be found in Appendix B, biological evaluation for wildlife.

Direct and Indirect Effects—Proposed, Threatened, Endangered & Sensitive Species—Alt. 1

There would be no change from the current condition. Potential habitat would not be altered.

Direct and Indirect Effects— Proposed, Threatened, Endangered & Sensitive Species—Alt. 2

Habitat for the species listed below is not expected to change conditions in the future as a result of this project.

Baird's shrew or its habitat may be impacted by the proposed project if they are present and using the forested riparian environment which may be present beyond the buffered stream areas. Riparian areas adjacent to streams are narrow because soils are porous and most water flow is subsurface. Most perennially flowing streams with riparian habitat have no-disturbance buffers which protect the habitat and usually the riparian habitat does not extend beyond the stream buffer. As harvest impacts are very small in terms of overall habitat in the project area. Impacts are not expected to result in a loss of viability in the planning area nor a trend toward federal listing or loss of species viability range wide. Riparian habitat is protected by riparian buffers in the project area. Past activities have had little impact on perennial streams in this area. Most streams are from seasonal runoff and not the type of habitat associated with riparian zones.

California Wolverine or its habitat is not expected to be affected by proposed project activities. Potential foraging may occur through the area as wolverine home ranges usually are between 170 to 270 square miles. Disturbance by equipment is of limited duration and not expected to impact wolverines which may forage through the area.

Pacific Fisher habitat or individuals are not expected to be impacted under these alternatives. The potential for effects to fishers is reduced because the probability is low that there are any fishers in the area. Carnivore surveys on the Detroit ranger district and the Willamette national forest did not detect fishers. Carnivore surveys as part of a regional survey

detected fishers only in those areas of southern Oregon where existing populations are descendant from individuals transplanted from other states.

Pacific fringe-tailed bats – Final Shelterwood Removal, Shelterwood Creation, Regeneration Harvest

Bats may be affected if trees which have potential to be used for nursery colonies are felled as hazards during harvest operations. Shelterwood units may contain potential nursery colony trees and may be felled as part of this activity. Potential habitat is much more likely to occur in old-growth stands in the project area outside of proposed units.

Pacific fringe-tailed bats – Commercial Thinning & Post and Pole Harvest

Bats may be affected if trees which have potential to be used for nursery colonies are felled as hazards during harvest operations. Potential habitat is much more likely to occur in old-growth stands in the project area outside of proposed units.

Pacific shrews or their habitat are not expected to be affected as a result of this proposed project. The habitat in the project area is more dry than humid and may not be suitable for pacific shrews. There is a potential for habitat removal and disturbance of individual shrews if they are present in the project area. Harvest impacts are expected to be very small if they occur at all. As project impacts are very small in terms of overall habitat in the drainage the impact on pacific shrews is inconsequential.

Oregon slender salamanders or their habitat are not expected to be affected as a result of this proposed project. There is potential for habitat removal and disturbance of individual Oregon slender salamanders if they are present in the project area. As project impacts are very small in terms of overall habitat in the drainage the impact on the Oregon Slender Salamander is inconsequential. Forested habitat is expected to remain forested and suitable for Oregon Slender Salamander occupancy. Impacts are not expected to result in a loss of viability in the planning area nor a trend toward federal listing or loss of species viability range wide.

Bald Eagles or their habitat are not expected to be affected as a result of this proposed project. The nearest bald eagle activity is foraging for trout at pine Ridge Lake east of the project area. There nearest known nesting pair of bald eagles is at Marion Lake about 3 ½ miles east of the project area.

Direct and Indirect Effects– Proposed, Threatened, Endangered & Sensitive Species—Alt. 3

Direct and indirect effects to Baird's shrew, California Wolverine, Pacific Fisher, Pacific shrews, Oregon slender salamanders, Bald Eagles are the same as those described in alternative 2 above. Direct and indirect effects to Pacific fringe-tailed bats are the same as those described in the section titled, "Pacific fringe-tailed bats – Commercial Thinning & Post and Pole Harvest" above.

Direct and Indirect Effects– Proposed, Threatened, Endangered & Sensitive Species—Alt. 4

Direct and indirect effects to Baird's shrew, California Wolverine, Pacific Fisher, Pacific shrews, Oregon slender salamanders, Bald Eagles are the same as those described in alternative 2 above. Direct and indirect effects to Pacific fringe-tailed bats are the same as those described in the

section titled, "Pacific fringe-tailed bats – Final Shelterwood Removal, Shelterwood Creation, Regeneration Harvest" above.

Cumulative Effects– Propose, Threatened, Endangered and Sensitive Species

There are no effects associated with past, present and reasonably foreseeable activities in the project area that when added to the effects of the proposed actions are expected to result in cumulative effects to Baird's shrew, California Wolverine, Pacific Fisher, Pacific shrews, Oregon slender salamanders, Bald Eagles and Pacific fringe-tailed bats.

Spotted Owls

Existing Condition– Spotted Owls

The northern spotted owl is primarily an inhabitant of old-growth and mature forests. Suitable spotted owl habitat contains adequate quantities of dead and down woody material, decadent trees, a medium to high crown closure, multiple layers in the overstory, and trees at least 200 years old or greater than 32 inches dbh (ISC Report 1990). However, all of the above characteristics do not need to be present for spotted owls to be present or for spotted owls to make use of an area, and for habitat to be determined suitable. The project is not occurring in a late successional reserve or a critical habitat area for spotted owls.

Part of the project is occurring in the Santiam Area of Concern for Northern Spotted Owl dispersal. Spotted owl dispersal habitat has also been reduced in the B&B and Puzzle fire areas east of the project area. This reduction in dispersal habitat makes the project area more important especially as a North/South corridor for dispersal. In consideration of the importance of this area, for north and south dispersal of spotted owls, no-disturbance corridors were left in the project area to maintain natural conditions in connecting corridors through the area.

Direct and Indirect Effects—Spotted Owls – Alternative 1

There would be no change from the current condition. Table 3-21 summarizes the number of acres removed from different categories of owl habitat by alternative.

Direct and Indirect Effects— Spotted Owls – Alternative 2

Commercial Thinning and Post and Pole Harvest --NLAA

Thinning of foraging and dispersal habitat will temporarily be disturbed in the short term by removing some trees. Over the long term, habitat will be improved by growth of larger diameter trees and more open canopy for foraging.

Commercial Thinning and Post and Pole Harvest --LAA

There are no activities that are likely to adversely affect Northern Spotted Owls.

Shelterwood Overstory Removal, Shelterwood Creation and Regeneration Harvests –NLAA

Because we are maintaining adequate dispersal habitat, the effects to Northern Spotted Owls are negligible. Dispersal habitat will be removed but the area will still provide adequate habitat post

harvest. Not enough dispersal habitat will be removed to drop below required levels. The Santiam Area of Concern (AOC) extends into the west half of the project area. In the Santiam AOC, this project would maintain 50% of each quarter township as dispersal habitat for the Northern Spotted Owl. This level of habitat preservation is mandated by the 2007-2008 programmatic biological assessment for habitat modification activities (England et. al., 2006).

Shelterwood Overstory Removal, Shelterwood Creation and Regeneration Harvests --LAA

Removal of 22 acres of foraging habitat occurs in three historic Spotted Owl activity centers. These adverse affects are occurring in non-reserve areas (matrix lands) which are not intended to provide foraging habitat. The U.S. Fish and Wildlife service anticipated that non-reserve areas would provide dispersal habitat between reserve areas of foraging/nesting habitat. More information on activity centers is available in the Wildlife Biological Evaluation, Appendix B p. 19. The Biological Opinion from the U.S. Fish and Wildlife Service states that there are no terms and conditions which apply to this project (USFWS, 2006).

Table 3-21 Changes in Habitat Availability by Alternative

Habitat Type	Acres Removed			
	Alt1	Alt2	Alt3	Alt 4
Nesting Habitat (Suitable)	0	0	0	0
Foraging Habitat (Suitable)	0	22	0	22
AOC Dispersal Habitat	0	109	0	109
Matrix Dispersal Habitat	0	145	0	145

Disturbance from habitat modification projects is evaluated based on distance from suitable habitat and a subset of this is distance from a known activity center which results in nesting disruption potential. Disturbance from Habitat Modification as a result of any action alternatives proposed by the Presley's Twin project would result in a may affect, not likely to adversely affect decision (MA-NLAA). Only MA-NLAA or no effect (NE) disturbance activities are planned to occur.

Communications with the U.S. Fish and Wildlife Service was conducted via Biological Opinion 1-7-06-F-0179.

Direct and Indirect Effects— Spotted Owls – Alternative 3

The direct and indirect effects as a result of alternative 3 are the same as those stated in sections Commercial Thinning and Post and Pole Harvest –NLAA and Commercial Thinning and Post and Pole Harvest –LAA above.

Direct and Indirect Effects— Spotted Owls – Alternative 4

The direct and indirect effects as a result of alternative 4 are the same as those stated in sections Shelterwood Overstory Removal, Shelterwood Creation and Regeneration Harvests –NLAA and

Shelterwood Overstory Removal, Shelterwood Creation and Regeneration Harvests –LAA above.

Cumulative Effects–Spotted Owls

Road maintenance involving the falling of dangerous snags has reduced the quality of spotted owl suitable habitat along road corridors in the project area. Wood cutting along roadways has also reduced the amount of down wood and thus lowered the quality of suitable habitat in road corridors. The action alternatives are not expected to compromise functionality of any Northern Spotted Owl home ranges or create barriers to dispersal across the project area. Other factors such as potential threats from wildfires, barred owl competition, great horned owl predation, West Nile Virus and sudden oak death may have long term unknown effects (USFWS, 2006). These effects are addressed in the five year review of the status of Northern Spotted Owls. This 5 year review process also considered information from the Sustainable Ecosystem Institute on June 22, 2004 (USFWS, 2004). The U.S. Fish and Wildlife Service considered these factors prior to consulting on this project. Any activities undertaken by this project comply with the terms and conditions set forth by the U.S. Fish and Wildlife Service.

3.6 Sensitive and Survey and Manage Botanical Species

3.6.1 Introduction – Sensitive and Survey and Manage Botanical Species

Sensitive and Survey and Manage botanical species, which include vascular plants, lichens, fungi and bryophytes contribute to the overall diversity of Detroit Ranger District vegetation. Many of these species are considered old-growth related.

Sensitive and survey and manage relate explicitly to significant issues as clarified in section 1.8, “Significant Issue: Connectivity and Biodiversity”. Design criteria was created for “connectivity and biodiversity” by deferring from treatment stands with unique ground cover which connect wet areas and riparian reserves creating a ‘corridor’ through the project area left untouched for enhancement of botanic diversity after project implementation.

By maintaining connectivity of particular habitat types with a leave corridor, this ensures dispersal and genetic exchange that contributes to non-vascular species viability. The other significant addition of the corridor is reserving the biodiversity of plant species through out the project area. By encouraging development of diverse species composition including hardwoods and other minor species through stand thinning, the number of habitats increases, thus the biodiversity of plant species.

Many of the sensitive species are also designated as survey and manage species (refer to the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines).

3.6.2 Regulatory Framework – Sensitive and Survey and Manage Species

- Forest Service Manual (FSM) 2670 ensures viability of sensitive biological species
- Amendment 158 to the Willamette Forest Plan (USDA, 1990) adds conservation strategies including management plans and monitoring requirements as well as background material on status and distribution of the species.

3.6.3 Analysis Methods – Sensitive and Survey and Manage Species

Botanical surveys were conducted in the summer of 2004 and summer and fall of 2006 in high probability areas which were selected using GIS and district maps. A biological evaluation was completed using the three required steps of pre-field review, field reconnaissance and risk assessment.

There are 17 species of fungi for which surveys were not conducted due to inconsistent fruiting and impracticality of conducting surveys over multiple seasons (USDA, USDI 2001). See the biological evaluation for sensitive botanical species in Appendix A for more details.

3.6.4 Existing Condition — Sensitive and Survey and Manage Species

Twenty seven of 72 region six sensitive plant, lichen and fungal species have habitat in the project area. No surveys are required for the 17 species of fungi (USDA, USDI 2001). Surveys for the remaining 10 species yielded two populations of sensitive species. These species are *Nephroma occultum* and *Gyromitra californica*. None of these plant species were actually located within any of the project units, but rather they were located within areas that are proposed for “Post Sale Resource Enhancement Projects” under ‘Proposed Action’ (section 1.4). *Gyromitra californica* was located within the Twin Meadow area while *Nephroma occultum* was located in a wetland south of road 2261-413, about 500 feet from the gate, on *Picea engelmannii*.

3.6.5 Environmental Consequences – Sensitive and Survey and Manage Species

Persistence of lichen species may be threatened by host tree removal, windthrow, changes in microsite conditions, changes in ecology of more open stands, and by dispersal limitations in more widely spaced stands (USDA, USDI 2003). In some cases thinning may be beneficial to these epiphytes by enhancing tree species diversity and by promoting the establishment and growth of a variety of hardwood species known for their abundant lichen communities.

Direct and Indirect Effects – Sensitive & Survey & Manage Species—Alternative 1

Under alternative 1; “No action”, no acres would be subject to shelterwood overstory removal or be thinned. The proposed thinning stands would undergo a slow decline with loss of vigor and increased mortality, before opening up enough to provide more understory species development.

Windthrow, snow down, and insect and disease pockets would create openings. Coarse woody debris would be abundant as trees die due to overcrowding.

In proposed shelterwood overstory removal stands, larger trees left for moderation of microclimate would remain. Effects to sensitive and survey and manage botanical species would likely be negligible based on the lack of occupied habitat found during surveys. Alternative 1 would provide the most benefit to sensitive and survey and manage fungi because most of them form mycorrhizal relationships with conifers and thinning has been shown to have negative short term (5-7 years) impacts to fungi (Pilz et al 2003). The well shaded dense remaining forested areas also provide for excellent habitat for several sensitive species that were not located during surveys.

Direct and Indirect Effects – Sensitive & Survey & Manage Species—Alternative 2

Under alternative 2, the proposed action, 1668 acres of timber would be harvested for about 19 MMBF of timber products. This includes regeneration with reserves, post and pole harvest, commercial thinning, shelterwood overstory removal and shelterwood creation. Along with these timber harvests, new spur roads and re-opening of temporary roads along with reconstruction and maintenance of existing roads would occur and grapple piles would be created.

The direct effects of the alternative 2, proposed action is elimination of sensitive species habitat but no direct effect to the known sensitive species within the project area. The indirect effects to the proposed action has a high probability for disturbance from increases water flow due to the lack trees. Both wetland and meadow areas that contain sensitive species are located down-slope with many drainages draining directly into and near these wetland areas.

If sensitive fungal species did exist in the project area, it is likely that individual sites of fungi may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and disruption of mycelial networks (Kranabetter and Wylie 1998, Amaranthus and Perry 1994). Twelve of the sensitive fungi are mycorrhizal and require a host plant. Reductions in the number of fruiting bodies of chanterelles, a common mycorrhizal species, were noted after initial thinning but appear to rebound after several years (Pilz et al 2003). Alternative 2 would remove much of the overstory on 921 acres, and thin 747 acres. If fungi occur in these stands, alternative 2 would have a greater impact on fungi than alternatives 3 or 4 due to the larger number of treated acres. Although individual and short term impacts may occur in any of the action alternatives, it is not likely to result in a trend toward federal listing or loss of viability for survey and manage and sensitive fungi species.

Regeneration harvest with reserves proposed in alternatives 2 is the most efficient method of converting these dense acres and root rot pockets into future late-successional and disease resistant habitat. However, two studies have shown that fungal species richness declines in forest openings (Durall, et al, 1999, Kranabetter and Wylie 1998). There is an optimal amount of organic debris and of moisture and too little or too much of either can be detrimental (Harvey,

et.al. 1981; O'Dell, et.al. 1999). Soil compaction resulting from harvesting equipment and the creation of temporary access roads can reduce host tree root growth and root tip availability for fungi (Amaranthus, et.al. 1996; Amaranthus and Perry 1994; Williamson and Neilson 2000).

Thinning may affect lichens by removing substrate, altering the microclimate (*Sarr et. al. 2005*), or by limiting dispersal (Sillett 1995). However, in these stands that are low in sensitive and survey and manage species presence, thinning can promote habitat quality by enhancing late-successional characteristics over the long term, resulting in greater diversity in stand structure and stand species. Kranabetter and Kroeger (2001) note that thinning prescriptions that leave some stand basal area with good tree vigor may accommodate both commercial timber harvest and mycorrhizal fungi. The development of understory trees and shrubs may benefit sensitive mycorrhizal species. Duff retention and coarse woody debris creation would benefit sensitive mycorrhizal and saprophytic species (Lindblad 1998).

Direct and Indirect Effects – Sensitive Survey and Manage Species—Alternative 3

Under alternative 3; only the commercial and post and pole thinning treatment portions of alternative 2 will occur, eliminating shelterwood creation or regeneration harvest units.

Under alternative 3, there will be no direct effect to the known sensitive species within the project area. Since this project mostly includes thinning, there most likely will not be indirect effects on wetlands, meadows and springs.

If sensitive fungal species did exist in the project area, it is likely that individual sites of fungi may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and disruption of mycelial networks (Kranabetter and Wylie 1998, Amaranthus and Perry 1994). Twelve of the sensitive fungi are mycorrhizal and require a host plant. Reductions in the number of fruiting bodies of chanterelles, a common mycorrhizal species, were noted after initial thinning but appear to rebound after several years (Pilz et al 2003). Alternative 3 proposes to only thin 747 acres. Alternative 3 would have the second greatest impact on fungi of all action alternatives, since habitat in these thinning stands contains more organic debris, is more mature, moister, more sheltered, and is generally more conducive to fungal development than the shelterwood overstory removal stands. Although individual and short term impacts may occur in any of the action alternatives, it is not likely to result in a trend toward federal listing or loss of viability for survey and manage and sensitive fungi species.

Thinning may affect lichens by removing substrate, altering the microclimate (*Sarr et. al. 2005*), or by limiting dispersal (Sillett 1995). However, in these stands that are low in sensitive and survey and manage species presence, thinning can promote habitat quality by enhancing late-successional characteristics over the long term, resulting in greater diversity in stand structure and stand species. Kranabetter and Kroeger (2001) note that thinning prescriptions that leave some stand basal area with good tree vigor may accommodate both commercial timber harvest and mycorrhizal fungi. The development of understory trees and shrubs may benefit sensitive mycorrhizal species. Duff retention and coarse woody debris creation would benefit sensitive mycorrhizal and saprophytic species (Lindblad 1998).

Direct and Indirect Effects – Sensitive Survey and Manage Species—Alternative 4

Under alternative 4; only the shelterwood overstory removal, regeneration with reserves and shelterwood creation portions of alternative 2 will occur.

There will be no direct effect to the known sensitive species within the project area from alternative 4. The indirect effects to the proposed action has a high probability for a change in the forest climate and decrease species diversity.

If sensitive fungal species did exist in the project area, it is likely that individual sites of fungi may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and disruption of mycelial networks (Kranabetter and Wylie 1998, Amaranthus and Perry 1994). Twelve of the sensitive fungi are mycorrhizal and require a host plant.

Alternative 4 proposes shelterwood overstory removal on 921 acres. Alternative 4 would have a high impact of action alternatives because removing shelterwood greatly increases the humidity and decreases the high quality habitat for a variety of old-growth species diversity. Although individual and short term impacts may occur in any of the action alternatives, it is not likely to result in a trend toward federal listing or loss of viability for survey and manage and sensitive fungi species.

Shelterwood overstory removal would have minimal effects to survey and manage species as these stands tend to be drier and more open with less organic matter and do not provide good habitat. Indirect effects to survey and manage and sensitive species and their habitats vary. Favoring minor tree species should lead to an increase in stand complexity and diversity over the long term (20-100 years). In the short term habitat may be reduced by potential host tree removal and a reduction in moisture retention capabilities as a result of the drying effect of thinning and shelterwood overstory removal. The risk of habitat reduction would go up with type and degree of disturbance (Alt. 2 > Alt. 3 > Alt. 4).

Cumulative Effects – Sensitive Survey and Manage Species

The area analyzed for cumulative effects is the 46,220 acres that comprise Marion Creek and Straight Creek sub-watersheds. Approximately 7,500 acres of old-growth forest was clear-cut and 5,000 acres salvage or otherwise partial cut in these sub-watersheds from 1950 to 1990. Additionally, approximately 1600 acres were shelterwood harvested, and 850 acres were commercially thinned. These forests may have contained multiple populations of survey and manage and sensitive botanical species, most likely old-growth dependent species such as *Pseudocyphellaria rainierensis* and *Nephroma occultum* before the previous commercial thinning. Fungal diversity declines with post harvest treatment such as prescribed and broadcast burning (Byrd, et al 2000, Bruns, et al 2002).

Two wilderness wildfires (B&B-2003 and Puzzle-2006) have burned over 17,000 acres near the eastern boundary of the analysis area. Despite the combined acreage of past harvest and wildfire activity, there are 11,700 acres of mature and old-growth forests still remaining in the two sub-watersheds, including unburned wilderness acres. These forests serve as refugia for

many survey and manage and sensitive species that would be available to re-colonize the younger stands as they mature and become more complex in structure and diversity.

Some cumulative effects could occur to fungal species not surveyed, but effects are expected to be small and localized.

Conclusions and Rationale Sensitive Survey and Manage Species

In the long-term (20-100 years), habitat for the majority of survey and manage and sensitive botanical species would be enhanced in the action alternatives. Dense stands that preclude understory growth and development of large trees, snags and down woody material provide poor habitat characteristics. Stand treatments proposed in this project should reverse that trend. The project area is surrounded by sufficient mature and old-growth habitat, and species present in those stands should re-colonize the younger stands as they mature and become more complex in structure and diversity.

3.7 Invasive Plants

3.7.1 Introduction – Invasive Plants

An invasive plant is defined as “a non-native plant whose introduction does or is likely to cause economic or environmental harm or harm to human health” (Executive Order 13122). Invasive plants are a threat to native plant communities because they arrive without the complement of predators, disease, and other ecosystem components found in their native region of the world and as a result can flourish unchecked. Most of these species take advantage of disturbance gaps such as logged units, roads, rock quarries, burned areas, and trails. Weed seeds can be introduced by wind, highway and off-road vehicles, construction equipment, water, animals, and humans. Once established, these populations generally disperse along roads and trail corridors.

3.7.2 Regulatory Framework – Invasive Plants

- The Final EIS for Pacific Northwest Region, Preventing and Managing Invasive Plants (USDA Forest Service PNW Region, May, 2005)
- Amendment 259 Willamette Land and Resource Plan (USDA 1990) prescribes that prevention be integrated into all management activities
- The Willamette National Forest Integrated Weed Management Plan (IWMP 1999)
- Guide to Noxious Weed Prevention Practices (2001)
- Executive Order 13112 (February 3, 1999)
- Noxious Weed Control and Eradication Act (2004)
- Willamette National Forest Noxious Weed Prevention Guidelines (2005)

3.7.3 Analysis Methods – Invasive Plants

Surveys for invasive species, including noxious weeds, were conducted in all stands. Surveys focused on priority treatment sites which are mapped in GIS tracked in a database.

3.7.4 Desired Future Condition – Invasive Plants

The desired future condition is the prevention of new invader establishments by stopping the spread and establishment of weeds. Disturbed areas would return to a more natural condition thus helping to retain special native habitats. Noxious weeds would not dominate these areas. This condition could be advanced through implementation of good management practices, minimization of disturbance where possible, and execution of mitigation measures such as invasive weed removal and native species re-vegetation and year monitoring up to 5 years.

3.7.5 Existing Condition — Invasive Plants

Roads serve as invasive species corridors due to their disturbed soils, greater light levels, and vehicle traffic (Parendes 1997). There are currently 146 miles of road in the analysis area, 37 of which are in the project area. Fourteen invasive weed species have been documented in the watershed. Although this project area has been subject to high levels of disturbance from past timber harvest and recreation use, existing invasive weed populations are relatively low compared to lower elevation sites. This is due to the short growing season, late season snow packs, and frost pocket conditions present at this elevation. Additionally, this area is bordered on two sides by wilderness and roadless areas that are nearly devoid of weeds.

The most serious weed infestations in and around the sale area are St. John's-wort (*Hypericum perforatum*), ox-eye daisy (*Chrysanthemum leucanthemum*), Scotch broom (*Cytisus scoparius*), spotted and diffuse knapweeds (*Centaurea maculata* and *Centaurea diffusa*), Himalayan and evergreen blackberries (*Rubus armeniacus* and *Rubus laciniatus*), yellow toadflax (*Linaria vulgaris*), tansy ragwort (*Senecio jacobea*), and common tansy (*Tanacetum vulgare*).

St. John's-wort, and ox-eye daisy are well established weeds of roads, meadows, and rocky openings. St. John's-wort is the most widespread species in the project area, and is most dense along the first few miles of Roads 2257 and 2261. It is adjacent to the northern most units along Road 2257, and western most units along Road 2261. Otherwise, occurrence of this weed is spotty.

Ox-eye daisy is spotty along the 2261-405 and 413 roads.

Scotch broom is an established weed that favors roadsides and early seral plantations. It is shaded out in late-successional stands. The seeds of Scotch broom can persist in the soil for decades and germinate when the soil is disturbed. There are some dense areas on Roads 2261 and 2257 leading to the project area. Scotch broom has a spotty distribution within the project area (5 plants pulled in Unit 17).

Spotted and diffuse knapweeds are “new invader” species that have recently spread off Highway 22 into areas just north and southwest of the project area.

Himalayan and evergreen blackberries prefer open areas and roadsides but also persist and spread under the forest canopy. Both species spread by animals that eat the berries and vegetatively by root tipping. These species are spotty along the portion of Highway 22 that runs parallel to the project area.

There is a small population of yellow toadflax on Road 2243, just on the other side of Highway 22 and the N. Santiam River.

Tansy ragwort and common tansy have light wind-blown seed. Both species are found along roadsides and can spread through early seral stands. Near the project area, they are found along Highway 22 and in managed stands north of Big Meadows.

3.7.6 Environmental Consequences – Invasive Plants

Direct and Indirect Effects – Invasive Plants – Alternative 1

The no action alternative has the least risk of spreading weeds. Few weed species can survive the dark conditions that would result from foregoing thinning in these stands. Although opportunities for survey and control funds would not be generated, there is less risk that weeds would spread into the closed canopy stands, not only due to light limitations but also because there would be no equipment in the stands that could potentially spread weed seeds.

Direct and Indirect Effects – Invasive Plants – Alternative 2

Alternative 2 would harvest 1668 acres of timber and produce about 19 MMBF of timber products. This includes regeneration with reserves, post and pole harvest, commercial thinning, shelterwood overstory removal and shelterwood creation. Along with these timber harvests, new spur roads and re-opening of temporary roads along with reconstruction and maintenance of existing roads would occur and grapple piles would be created.

This alternative has the highest direct and indirect effects to invasive plants due to the highest ground disturbances (see table 3-22). Effects are due to a combination of soil disturbance and transport of seed. Areas that would be permanently opened up to light such as roads and landings would be most at risk. These areas are disproportionately subject to ground disturbance and exposure to vehicles and equipment that may bring in seed. Thinning may enhance habitat for all of these weed species by opening up the canopy and creating seed germination sites by disturbing the soil. New weed species may be introduced on logging and slash treatment equipment. Alternative 1 which harvests the most acres and constructs the greatest length of road have a higher risk of weed invasion.

Mitigation measures are included that close and rehabilitate roads and landings. In addition, timber sale contracts now require provisions that minimize the introduction and spread of invasive plants, including equipment cleaning and harvesting weedy sites last. Monitoring and treatment will also occur within the project area up to 5 years.

In the Risk Matrix, table 3-22, alternative 2 shows the highest risk of invasive weed encroachment due to a larger level of ground disturbance and habitat modification represented by more acres harvested and more landings utilized. With the increase of acres in alternative 2 over alternatives 3 & 4, more money generated by this alternative would be available for weed surveys and control after thinning occurs.

Direct and Indirect Effects – Invasive Plants – Alternative 3

Under alternative 3 only the commercial and post and pole thinning treatment portions of alternative 2 will occur, eliminating shelterwood creation or regeneration harvest units.

Alternative 3 represents the lowest risk of propagation of weeds with fewer landings developed and used, fewer miles of temporary road created and reopened, and the fewest acres harvested (Please see table 3-22). This alternative has fewer direct and indirect effects than alternative 2 due to less ground disturbing activities.

Effects are due to a combination of soil disturbance and transport of seed. In this alternative, the areas that would be permanently opened up to light such as roads and landings would be most at risk. These areas are disproportionately subject to ground disturbance and exposure to vehicles and equipment that may bring in seed. Thinning may enhance habitat for all of these weed species by opening up the canopy and creating seed germination sites by disturbing the soil. New weed species may be introduced on logging and slash treatment equipment. Alternatives that harvest the most acres and construct the greatest length of road have a higher risk of weed invasion.

Mitigation measures are included that close and rehabilitate roads and landings. In addition, timber sale contracts now require provisions that minimize the introduction and spread of invasive plants, including equipment cleaning and harvesting weedy sites last. Monitoring and treatment will also occur within the project area up to 5 years.

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Direct and Indirect Effects – Invasive Plants – Alternative 4

Under alternative 4 only the shelterwood overstory removal, regeneration with reserves and shelterwood creation portions of alternative 2 will occur, eliminating commercial and post and pole thinning treatment harvest units

Alternative 4 proposed action has a lower risk of propagation than alternative 2 with less roads being opened than alternative 3 (Please see table 3-22). This alternative has a fewer direct and indirect effects than alternative 2 because it disturbs less ground.

Effects are due to a combination of soil disturbance and transport of seed. In the proposed action alternatives, the areas that would be permanently opened up to light such as roads and landings would be most at risk. These areas are disproportionately subject to ground disturbance and exposure to vehicles and equipment that may bring in seed. Thinning may enhance habitat for all of these weed species by opening up the canopy and creating seed germination sites by disturbing the soil. New weed species may be introduced on logging and slash treatment equipment. Alternatives that harvest the most acres and construct the greatest length of road have a higher risk of weed invasion.

Mitigation measures are included that close and rehabilitate roads and landings. In addition, timber sale contracts now require provisions that minimize the introduction and spread of invasive plants, including equipment cleaning and harvesting weedy sites last. Monitoring and treatment will also occur within the project area up to 5 years.

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Mitigation measures are included that close and rehabilitate roads and landings. In addition, timber sale contracts now require provisions that minimize the introduction and spread of invasive plants, including equipment cleaning and harvesting weedy sites last. Monitoring and treatment will also occur within the project area up to 5 years.

In the Risk Matrix, table 3-22, alternative 2 shows the highest risk of invasive weed encroachment due to a larger level of ground disturbance and habitat modification represented by more acres harvested and more landings utilized. With the increase of acres in alternative 2 over alternatives 3 & 4, more money generated by this alternative would be available for weed surveys and control after thinning occurs.

Table 3-22 Invasive Weed Introduction and Establishment Potential

Activity	Alt. 1	Alt. 2	Alt. 3	Alt.4
Acres treated	0	1668	779	889
Construct new native-surface temporary road (miles)	0	0.6	0.2	0.4
Reopen existing temporary roads (miles)	0	3.5	0.5	3.0
Road maintenance (miles haul routes)	0	20	20	2
Subsoil skid roads (acres)	0	10	0	10

Cumulative Effects – Invasive Plants

The areas analyzed for cumulative effects are the Marion and Straight Creek sub-watersheds. Assuming seed sources are nearby or transportable, the more disturbance and activity any given area is subject to, the more the risk of noxious weed introduction, establishment, and/or expansion. Past road construction and maintenance (146 miles in the analysis area), timber harvest (approximately 19,400 acres on Forest Service lands), and recreation use has contributed to the incremental increase in invasive weeds. Since the 1970's, the majority of the timber sale activity in this area has steadily decreased. Use of highway 22, the major source and vector for invasive weeds, has steadily increased with recreation use. Two wilderness wildfires (B&B-2003 and Puzzle-2006) have burned over 17,000 acres in the eastern boundary of the analysis area. Should invasive weeds recruit into these burned areas, risk of spread into the Presley's Twin project area would increase. Road maintenance, vehicular traffic, and harvest on private lands would continue in the foreseeable future and may spread or introduce weed seed, leading to new infestations.

Due to the low number of weed sites in the project area and mitigation measures that would re-close temporary roads and rehabilitate landings the cumulative effects should be minor.

The spread of invasive weeds would be minimized through preventative measures taken prior to, during, and after thinning operations. All action alternatives provide mitigation measures that would reduce the long-term likelihood of expanded weed populations. These include logging equipment washing, post-treatment survey and control through post sale projects, and pretreatment of existing weed sites when opportunities exist. The canopy in the treated stands is expected to close in 10 to 20 years, and this would further reduce habitat for some weed species.

3.8 Special Habitats

3.8.1 Introduction – Special Habitats

Biodiversity can be defined as the spatial and temporal distribution and abundance of different plant and animal communities and species. In a forested landscape, it is important to maintain or enhance biodiversity in order to facilitate ecosystem function. Forest management has the potential to disrupt ecosystem function by changing the balance of species distribution and abundance, and disrupting the flows and processes inherent within an ecosystem. Some habitat types have attributes that support a larger variety of animal and plant communities, and these habitat types can be limited in extent. They include old-growth, riparian areas, and special habitats. Forest plan direction (see next section) to protect these habitats is intended to restrict the disruption of ecosystem function caused by forest management. This includes leaving intact corridors between these habitat types that allow for the continued flow of species and their genetic exchange.

Special habitats are non-forested areas including meadows, ponds, caves, rock gardens, talus and cliffs. These sites are important reservoirs of biodiversity and provide habitat for a wide variety of plants, fungi, and animals, many of which are not found in forested areas. In fact, while special habitats cover only about 5% of the area in the Cascades Range, 85% of native flowering plants are found in these areas (*Hickman 1976*). In addition, special habitats provide habitat for many species currently on the Region 6 Sensitive Species List.

3.8.2 Regulatory Framework – Special Habitats

- Willamette National Forest Special Habitat Guide (Dimling and McCain 1996)
- Forest Plan Standards and Guidelines FW-201 through FW-214

3.8.3 Analysis Methods – Special Habitats

Special habitats, identified on aerial photos and from GIS database, were inventoried during the course of vegetation typing and project area survey for sensitive botanical species.

3.8.4 Desired Future Condition – Special Habitats

The desired condition for special habitats is to minimize direct and indirect influence from project disturbance, and to maintain microclimatic and site conditions within the historical range by precluding the introduction and establishment of non-native invasive weeds.

3.8.5 Existing Condition — Special Habitats

The Presley's Twin project area has been impacted and highly fragmented by previous harvest activities. This experienced selective partial cutting which has impacted normal stand structure and development by removing dominant trees. This process has resulted in high subdominant densities which leaving tree species more susceptible to insect and disease. Due to the high elevation of this area, regeneration takes longer. The area has been subject to ground based harvest methods, creating skid roads that are easily accessed by the public and do not recover quickly due to the short growing season. Since most streams run east-west on this broad bench, there is little north-south continuity between riparian areas. Although few intact old-growth stands remain in this project area, some of the mature stands have been subject to less management disturbance (e.g., some salvage and partial cutting) and exhibit old-growth characteristics such as plenty of down wood, and multi-layered, uneven aged canopies.

The number of non-forested habitats (meadows, outcrops, cliffs, rock gardens) is relatively low in the Presley's Twin project area, and most of those that do exist have been disturbed by past human and management action. There are few surface water features as a result of sub-surface water flow but scattered areas of high diversity hydric/mesic plant communities exist where the water table is close to the surface.

Sedge meadows, seasonal ponds, and associated shrub stands are the most common special habitats in the area. Many of the special habitats in the Presley's Twin project area are within managed stands, or adjacent to managed stands and roads. These special habitats provide habitat for various plant communities and contribute to species diversity of the area, which is otherwise fairly uniform.

3.8.6 Environmental Consequences – Special Habitats

Direct and Indirect Effects –Special Habitats –Alternative 1

There would be minimal effects to special habitats under the no action alternative. Trees in or surrounding the special habitats would continue to grow but at a slower pace than under the action alternatives due to the lack of thinning. Weed populations in the surrounding areas are less likely to spread into special habitats. Effects could result from continued insect and disease spread in the absence of stand treatment, resulting in conversion of large areas to an early seral condition. Without thinning, many overstocked portions of these stands would be slow to develop desired structure and function. Lack of thinning around these special habitats may preclude recruitment and encroachment and prevent the development of species diversity.

Direct and Indirect Effects –Special Habitats –Alternative 2

Special habitats are protected from physical disturbance in all action alternatives. No special habitats occur in proximity to planned temporary spur roads or landings. Prescribed buffers would be sufficient to protect the microclimate and prevent invasive weed introduction. Not all special habitats are buffered. In cases where the prescription is to thin stands surrounding the relevant habitats, and the site is protected from physical disturbance, it is unlikely that the resultant canopy opening would substantially affect the plant community within the units.

Negative impacts to biodiversity as a result of implementation of alternatives 2 include widespread ground disturbance over a continuous project area, possibly disrupting local pockets of diverse ground vegetation such as hydric/mesic plant communities and increasing the risk of disturbance and invasive weed introduction. There is a high probability of downstream effects since all units are upslope from known special habitats such as Twin Meadows which was discovered to contain sensitive species and other wetland areas down-slope and surrounding the project units.

Impacts from alternatives 2 would be ameliorated by a project design corridor, which retains a no-harvest pathway for species dispersion by connecting many of these pockets of hydric/mesic vegetation with riparian corridors and special habitats. This corridor includes portions of stands that have been subject to the least management disturbance. The corridor would act as a physical barrier to invasive weed spread by reducing the amount of disturbed acres which could serve as potential weed habitat. Post implementation monitoring would also allow analysis and maintenance of any erosion or down-stream effects.

Direct and Indirect Effects –Special Habitats –Alternative 3

Special habitats are protected from physical disturbance in all action alternatives. No special habitats occur in proximity to planned temporary spur roads or landings. Prescribed buffers would be sufficient to protect the microclimate and prevent invasive weed introduction. Not all special habitats are buffered. In cases where the prescription is to thin stands surrounding the relevant habitats, and the site is protected from physical disturbance, it is unlikely that the resultant canopy opening would substantially affect the plant community.

Negative impacts to biodiversity as a result of implementation of alternatives 3 include widespread ground disturbance over a continuous project area, possibly disrupting local pockets of diverse ground vegetation such as hydric/mesic plant communities and increasing the risk of disturbance and invasive weed introduction. There is a high probability of downstream affects since all units are upslope from known special habitats such as Twin Meadows which was discovered to contain sensitive species and other wetland areas down-slope and surrounding the project units.

Impacts from alternatives 3 would be ameliorated by a project design corridor, which retains a no-harvest pathway for species dispersion by connecting many of these pockets of hydric/mesic vegetation with riparian corridors and special habitats. This corridor includes portions of stands that have been subject to the least management disturbance. The corridor would act as a physical barrier to invasive weed spread by reducing the amount of disturbed acres which could serve as potential weed habitat. Post implementation monitoring would also allow analysis and maintenance of any erosion or down-stream effects.

Direct and Indirect Effects –Special Habitats –Alternative 4

Special habitats are protected from physical disturbance in all action alternatives. No special habitats occur in proximity to planned temporary spur roads or landings. Prescribed buffers would be sufficient to protect the microclimate and prevent invasive weed introduction. Not all special habitats are buffered. In cases where the prescription is to thin stands surrounding the relevant habitats, and the site is protected from physical disturbance, it is unlikely that the resultant canopy opening would substantially affect the plant community.

There is a high probability of downstream affects since all units are upslope from known special habitats such as Twin Meadows which was discovered to contain sensitive species and other wetland areas down-slope and surrounding the project units.

Alternative 4 has the lowest risk to special habitats and biodiversity. Disturbance as a result of alternative 4 would occur on recently managed acres already converted to an earlier seral stage. Post implementation monitoring would also allow analysis and maintenance of any erosion or down-stream effects.

Cumulative Effects – Special Habitats – Alternative 1

Past management activities have impacted special habitats, including changes to the microclimate and hydrology, soil compaction and introduction of invasive weeds. Approximately 13% of the total acres regenerated in the cumulative effects area has been harvested in the past 20 years. Thirty-one percent of the acres of partial cutting, salvage cutting and shelterwood cutting have occurred in the past 20 years. This indicates a slowdown in the most disruptive types of management and allows more time for stand recovery. The no action alternative would continue these trends. There are no cumulative effects anticipated as a result of the no action alternative.

Cumulative Effects – Special Habitats – Alternatives 2, 3, & 4

Past timber harvest, road construction and associated activities on public and private lands have adversely affected special habitats by introducing invasive weeds and altering the microclimate. As mentioned under alternative 1, 31% of the total managed acres have been entered within the last two decades. Alternative 2 would add an additional 9% to that figure, and either alternative 3 or 4 would add an additional 6%. Foreseeable future actions would not add an upward trend to this level of management. Wilderness comprises 47% of the analysis area where no management would occur. However, beneficial effects of alternatives 2 or 3 include stand treatment that could abate the threat of fire, insect and disease that might spread outside wilderness boundaries. The thinning actions in alternative 4 could also give a measure of fire protection. Alternatively, these events would increase risk of microclimate change and invasive weed spread to special habitats, and other biodiversity values (riparian, old-growth) in the project area.

Conclusions and Rationale – Special Habitats

Beyond the scenarios mentioned above, with the protective measures included in all action alternatives, additional cumulative effects are not anticipated to special habitats and other biological diversity values.

3.9 Soils

3.9.1 Introduction

Short-term impacts to soil productivity from harvest activity, as discussed in the Willamette National Forest Final Environmental Impact Statement, include displacement, compaction, nutrient loss, and instability (FEIS 1990). In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity. The total area of cumulative detrimental soil conditions should not exceed 20% of the total acreage within the activity area, including roads and landings.

3.9.2 Regulatory Framework

- 36 C.F.R. 219.14(a) classifies lands that are not suited for timber production Non-forest;
- NFMA 6(g)(3)(E)(i)) not suited for timber due to irreversible soil or watershed damage
- Forest Service Manual R-6 Supplement No. 2500.98-1 -- direction for activities where soil quality standards are exceeded from prior activities
- USDA FS Pacific Northwest Region handbook on General Water Quality Best Management Practices (November, 1988) T-1, T-2 and T-3 apply to soils
- Willamette Forest Plan Standards and Guidelines FW-079 to FW-114

3.9.3 Analysis Methods

The information for this specialist report was obtained by intensive field reconnaissance through three field seasons in 2004, 2005 and 2006. The proposed units as well as surrounding terrain were surveyed. In almost all units, where ground based harvest methods were proposed, transects were walked and information taken to determine extent of existing disturbance and compaction, as a percentage of the transect distance.

3.9.3.1 Displacement

Existing Condition – Displacement

Displacement occurs with three separate timber harvest activities: yarding, slash treatment, and road building and maintenance. All units have had some level of previous entry and displacement. This discussion of the existing condition applies to all the proposed sale units.

Displacement is defined as the removal of more than 50% of the topsoil or humus enriched soil horizons from an area of 100 square feet which is at least 5 feet in width. Displacement can occur with timber management during road or landing construction, yarding, or the mechanical treatment of slash, such as machine piling. Contract requirements which reduce or eliminate displacement are the primary way to minimize this concern.

Yarding activities on the existing plantations have occurred with the appropriate suspension requirements. Slash treatments usually maintained some duff, though the current retention standards may not have been achieved. Some of the oldest managed stands may have been tractor piled. Tractor piling can result in excessive disturbance and compaction. Tractor piling has not been considered acceptable as a management tool for over 20 years on the Willamette National Forest. Stand, shrub and brush growth, as well as duff accumulation over the decades has provided an effective ground cover. At this point in time, little physical evidence can be found to indicate whether these two timber management activities resulted in substantial, long-term detrimental soil displacement or off-site soil movement.

Road development in this project area is extensive; most large blocks of forest have been accessed. Most major road systems were constructed in the 1960s and 1970s with older road construction standards. Almost all roads are located on stable benches, flats or ridges. The

amount of new road construction slowed considerably in the late 1980s, and with subsequent entries, reconstruction began to dominate. Newer roads, when required, were constructed to better standards. Road grades were steepened and pitched to better fit roads to the terrain. Cuts and fills were minimized, and drainage controls were added to promote long term slope stability. Most road cuts and fills have naturally regenerated. Because the side slopes are relatively gentle and overland flow is limited throughout this project, erosion from roads is not generally considered a concern, except in a few localized areas.

Direct and Indirect Effects– Displacement –Alternative 1

With the no action alternative, displacement or the loss of soil cover would not occur because of harvest activities. Displacement could occur as a result of wildfire-generated erosion. Over time, the increasing fuel loads that would be expected in the absence of thinning and fuels treatments could be associated with greater fire intensity, severity and rates of spread. Under this alternative, the stands and underlying brush would continue to grow, and in the shorter term, ground cover would increase.

Direct and Indirect Effects– Displacement –Alternative 2

The logging suspension requirement for a proposed unit is mandated in the Willamette Forest Plan to protect the soil from excessive disturbance or displacement (FW-107 and BMP T-12). The area near tail trees and landings is generally excluded from this suspension constraint. Where applicable, streams will have full suspension or yarding away from the stream course (MA-15-27). The primary yarding method for all units would be ground based systems with pre-designated skid roads and directional falling as appropriate.

Ground-based yarding systems may be employed on those acres in each unit where slopes are gentle enough (generally 30% or less) for ground-based systems. Ground based yarding systems, such as processor / forwarder, conventional line pulling or shovel, could be utilized. Crossings at ephemeral swales will be designated by the timber sale officer to cross at a right angle during dry periods. All ground based yarding would require the LTSR (Located Tractor Skid Road) clause, and/or line pulling and directional falling, as appropriate. In all cases, existing skid or haul roads would be utilized before any additional new skid or forwarder roads are developed. Skyline yarding with one end or partial suspension would be used in portions of Units 8 and 49 where side slopes exceed 30% and are too steep for ground based systems.

Disturbance from yarding would be well within the regional and forest standard and substantial adverse impacts are not anticipated. With appropriate suspension during logging, soil disturbance is minimal and off site erosion is essentially non-existent. During harvest, the retention of stream adjacent trees and the requirement of full suspension yarding over or away from stream courses would minimize or eliminate off-site erosion.

Direct and Indirect Effects– Displacement –Alternative 3

Displacement effects of alternative three would be similar to those described in alternative 2 except there would be no skyline harvest in unit 8 as it is a final shelterwood removal unit.

Direct and Indirect Effects– Displacement –Alternative 4

Displacement effects of alternative three would be similar to those described in alternative 2 except there would be no skyline harvest in unit 49 as it is a commercial thinning unit.

Cumulative Effects -- Displacement

Cumulative effects are discussed collectively for displacement, compaction, nutrient loss and instability at the end of the soils section.

3.9.3.2 Compaction**Existing Condition – Compaction**

Table 3-23 shows the existing condition for current compaction levels. Ranges of compaction represent some degree of uncertainty in the presence of compacted skid roads because of brush or other factors. Additional information on survey methods and design is located in the soil scientist specialist report in the Project file located at the Detroit Ranger District.

Table 3-23 Existing Soil Compaction Levels

Unit	% Compacted	Unit	% Compacted
1	7-8	30	15
2	10	40	2-4
3	<2	41	11-13
4	west portion 7, east portion 15-20	411	11-13
5	12-15	42	6-11
6	6-9	43	7-12
7	1-2	44	6
8	3-4	45	6-7
9	10-12	46	8
10	was 20, unit subsoiled, now 2%	47	8-9
11	east portion 1-2, west portion 10	49	<1
12	1-2	491	<1
13	12-20	50	10-14
14	2-12	53	10
15	18-20	54	10-11
16	2-9	55	9
161	7	56	11-16
17	10	561	11-16
18	9	57	<1-6

Unit	% Compacted	Unit	% Compacted
19	10-11	59	east portion 9, west portion 2-4
20	12-14	60	east portion 7-15, west portion 6-10
21	5-10	61	7-10
22	10	62	north portion 7 south portion 10
23	18 max, difficult to evaluate	63	7-10
24	25	80	10
25	8-10	81	6
26	7-10	82	10-12
27	18-20, difficult to evaluate		
28	7		
29	15-17		

The major source of compaction and also much disturbance is ground based skidding equipment. Unrestricted tractor yarding and tractor piling are not considered an option on those landtypes where side slopes are gentle enough (generally less than 30%) to support tractor usage (BMP T-9 and VM-1, and FW-107). The silty nature of the fine-grained soils and evidence that substantial soil moisture is available most of the year indicate that any type of unrestricted tractor yarding and piling would lead to excessive soil compaction and/or disturbance. Restricted tractor yarding from pre-designated skid roads (LTSR) is considered an option (BMP T-11). With tractor yarding, skid roads are pre-designated and approved in advance by the timber sale officer and generally 150 to 200 feet apart. With a processor/forwarder system the skid roads are usually only about 50 to 60 feet apart, but the number of trips for each individual road are substantially less than with skidding. 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. Yarding over frozen ground or over a deep, solid snow pack of 24 inches of dense snow or the equivalent also reduces soil disturbance and compaction (BMP VM-4).

Monitoring has shown that when designated skid roads are properly utilized in conjunction with line pulling and directional falling, compaction from ground-based tractor operations generally remains at about 9 to 13%.

Evidence of compaction from previous entries is still present. Most of the proposed units showed some level of existing compaction. In no case was compaction measured directly. Heavily disturbed skid roads, landings or other areas where equipment tracks were evident are considered adversely compacted. Transects measure the amount of compacted ground along a line within a proposed unit. They were generally oriented to obtain information on management activities. They are not random, nor statistically representative of a particular unit. However, they do provide a strong indication of the degree of concern for the unit under investigation. In some cases multiple transects were walked in some units in different directions in order to 1) provide more information, or 2) to monitor and evaluate the initial results for accuracy. Ranges indicate some degree of uncertainty in the presence of compacted skid roads because of brush or other factors.

Field investigation indicates that Unit 24, currently at 25%, exceeds the Willamette National Forest FW-081 Standard of 20%. Units 15, 23, 27 and 29 at 18-20%, <18%, <18-20% and 15-17% respectively, approach the standard. One of the goals with entry into all these units is to provide the opportunity to subsoil the existing skid roads as much as is practical in order to reduce compaction to more acceptable levels. With entry into these units, evident skid or haul roads would be utilized before any new skid road is approved. However, it is possible with this proposed action that cumulative compaction may exceed the threshold at the completion of harvest activities. Consequently, required subsoiling is proposed in Units 15, 23, 24, 27, and 29 to insure that cumulative levels remain below the 20% standard. Based on previous experience, this effort should be successful. For example in Unit 10 (listed above), with past subsoiling the overall compaction was reduced from near 20% to about 1/10th that value. Subsoiling may be curtailed in some areas in order to reduce the amount of root pruning of leave trees and to avoid excessive amounts of exposed soil. Because of this fact, compaction in Unit 24 would be reduced, but may or may not be below the 20% level at the completion of mitigation.

Desired Future Condition – Compaction

Compaction is defined as an increase in soil bulk density of 15% or more and/or by a reduction of macro pore space of 50% over the undisturbed soil. Excessive soil compaction from heavy, mechanized equipment used during logging can decrease soil productivity by restricting root growth, reduce rainfall infiltration rates, and increasing over land flow and run off. Prior management on some units, conducted before any requirements were established, created compaction conditions which now approach or exceed the currently accepted Standards and Guidelines. Activities which minimize further compaction such as skyline logging, utilize existing compacted areas as much as possible, or reduce existing compaction through subsoiling are recommended.

Direct and Indirect Effects – Compaction – Alternative 1

Compaction would not occur from harvest equipment. Existing compaction would continue to be slowly ameliorated by freeze and thaw, as well as mixing caused by plants and animals such as worms beetles and slugs.

Direct and Indirect Effects – Compaction – Alternative 2

At the completion of harvest activities, some subsoiling is recommended for most units in order to reduce compaction at heavily used haul roads, spur truck roads, and landings. Subsoiling would be required in final shelterwood removal units 15, 23, 24, 27, and 29 totaling approximately 100 acres. Assuming approximately 10% reduction in compaction, 10 acres needs to be subsoiled. At about \$350 per subsoiled acre, this totals \$3500 of required mitigation. With the use of designated skid roads, the reuse of the existing skid road system, and the subsoiling of

primary landings and skid roads, compaction is not anticipated to exceed the 20% value in any unit and should be below the 15% level (or lower) in most units.

Skyline operations in thinning units with small wood and intermediate supports usually impacts less than 1% of the unit area. Skyline yarding is proposed for portions of Units 8 and 49. These units had low existing compaction levels at 3 – 4% and <1% respectively. Skyline landings are primarily planned at old existing landings, road turnouts, and road junctions. Little new spur road would be required.

Some units may require temporary roads to access suitable landing sites for either ground based or skyline yarding systems. In all cases, these temporary roads are located on gentle stable side slopes in common material. No full bench construction is required and for the most part, no active drainages are crossed. Some units are accessed by opening old logging roads constructed many decades ago. In most cases, use of these old roads would allow for drainage structure improvements and fill stabilization. Some units are accessed by using newer Forest Service roads that now require some additional work to maintain adequate road drainage and surface integrity. In summary, development of the transportation system for this sale would maintain slope stability, would produce little or no off site erosion, and would provide opportunity to rehabilitate old road courses.

Direct and Indirect Effects – Compaction – Alternative 3

Direct and indirect effects as a result of alternative 3 would be similar to those described in alternative 2 except there would be no essential subsoiling and there would be no skyline yarding in unit 8, only unit 49.

With the use of designated skid roads, the reuse of the existing skid road system, and the subsoiling of primary landings and skid roads, compaction is not anticipated to exceed the 20% value in any unit and should be below the 15% level (or lower) in most units.

Skyline operations in thinning units with small wood and intermediate supports usually impacts less than 1% of the unit area. Skyline yarding is proposed for portions of Unit 49. This unit had low (<1%) existing compaction. Skyline landings are primarily planned at old existing landings, road turnouts, and road junctions. Little new spur road would be required.

Some units may require temporary roads to access suitable landing sites for either ground based or skyline yarding systems. In all cases, these temporary roads are located on gentle stable side slopes in common material. No full bench construction is required and for the most part, no active drainages are crossed. Some units are accessed by opening old logging roads constructed many decades ago. In most cases, use of these old roads would allow for drainage structure improvements and fill stabilization. Some units are accessed by using newer Forest Service roads that now require some additional work to maintain adequate road drainage and surface integrity. In summary, development of the transportation system for this sale would maintain slope stability, would produce little or no off site erosion, and would provide opportunity to rehabilitate old road courses.

Direct and Indirect Effects – Compaction – Alternative 4

Direct and indirect effects as a result of alternative 4 would be similar to those described in alternative 2 except there would be no skyline yarding in unit 49, only unit 8.

At the completion of harvest activities, some subsoiling is recommended for most units in order to reduce compaction at heavily used haul roads, spur truck roads, and landings. Subsoiling would be required in final shelterwood removal units 15, 23, 24, 27, and 29 totaling approximately 100 acres. Assuming approximately 10% reduction in compaction, 10 acres needs to be subsoiled. At about \$350 per subsoiled acre, this totals \$3500 of required mitigation. With the use of designated skid roads, the reuse of the existing skid road system, and the subsoiling of primary landings and skid roads, compaction is not anticipated to exceed the 20% value in any unit and should be below the 15% level (or lower) in most units.

Skyline operations in thinning units with small wood and intermediate supports usually impacts less than 1% of the unit area. Skyline yarding is proposed for portions of Units 8 and 49. These units had low existing compaction levels at 3 – 4% and <1% respectively. Skyline landings are primarily planned at old existing landings, road turnouts, and road junctions. Little new spur road would be required.

Some units may require temporary roads to access suitable landing sites for either ground based or skyline yarding systems. In all cases, these temporary roads are located on gentle stable side slopes in common material. No full bench construction is required and for the most part, no active drainages are crossed. Some units are accessed by opening old logging roads constructed many decades ago. In most cases, use of these old roads would allow for drainage structure improvements and fill stabilization. Some units are accessed by using newer Forest Service roads that now require some additional work to maintain adequate road drainage and surface integrity. In summary, development of the transportation system for this sale would maintain slope stability, would produce little or no off site erosion, and would provide opportunity to rehabilitate old road courses.

Cumulative Effects – Compaction

Cumulative effects are discussed collectively for displacement, compaction, nutrient loss and instability at the end of the soils section.

3.9.3.3 Nutrient Loss***Existing Condition – Nutrient Loss***

Most of the stands in this project area had an active fire history in the last 100 to 200 years. As a result, large expanses never had much down woody debris, or all of the accumulating down woody debris was removed by the fires. Many of the managed stands also had the initial harvests when specifications for piling unmerchantable material (PUM) were in effect. This required that larger waste material (usually 8 inches wide and 10 feet long or greater) be removed from the

units to reduce fire intensity. In addition, most managed stands were broadcast burned or under burned, which removed additional amounts of above ground organic matter. Consequently across numerous older managed stands, management generated, down woody debris – larger than 8 inches wide and 10 feet long– is absent or at low levels. Younger plantations retained much more slash and large woody debris as was the current Forest plan direction. As a result, a wide range in the above ground tonnage of decomposing organic matter exists with amounts generally varying with management history and fire intensity. The variety exists both between and within units.

Desired Future Condition – Nutrient Loss

The actual thinning or harvest of these units is not as much a concern for long term soil productivity as the concomitant slash accumulation and the potential for wild fire. Activities, which reduce stocking levels, improve stand vigor, and eliminate excessive fuel loading are favored. Fire recurrence intervals of 100 to 200 years are apparent in the natural system, with shorter intervals recorded in some critical high lightning areas.

Direct and Indirect Effects – Nutrient Loss – Alternative 1

The no action alternative is considered detrimental to long-term soil productivity. The primary mechanism for nutrient loss is uncontrolled wild fire. Overstocked stands would rapidly see density increase, growth slow, and mortality rise. Over time, the increasing fuel loads that would be expected in the absence of thinning and fuels treatments could be associated with greater fire intensity, severity and rates of spread. Fuel accumulations from blow down, snow down, and bug kill provide an ever increasing amount of fuel loading.

Direct and Indirect Effects – Nutrient Loss – Alternative 2

In the unit summary section, objectives for duff retention would be specified for each unit. For all action alternatives, within the shelterwood overstory removal units, slash would be scattered in the units, piled and burned, or broadcast or under burned. Piling may occur by hand or with a grapple machine. Grapple piling occurs with a grapple not with a dozer brush rake. Grapple piling requires only one pass of the machine across the landscape, and the machine works while sitting on slash. Extensive monitoring of grapple machine piling operations indicates that little or no additional compaction or displacement occurs. On typical thinning, hand piles number about 40 per acre and occupy about 20 square feet per pile for a total of about 800 square feet per acre or about 1.8% per acre. Machine piles are substantively less in number, but correspondingly larger in size so that the 1.8 to 2% figure is maintained. Burning the piled slash may develop sufficient heat to affect the underlying soil. However, pile burning is usually done in the fall or winter months when duff and soil moistures are higher, and this helps reduce the downward heat

effects to the soil. Pile burning is considered a minor effect because of the limited overall acreage involved.

Another aspect of long term nutrient availability and ecto-mycorrhizal formation is the amount of larger woody material retained on site. Management activities would be planned to maintain enough large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085). At this time, site specific needs would be considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended).

Duff retention objectives would be provided on a unit-by-unit basis in the unit summary table. Concentrations of larger down logs that were produced naturally with the initial harvest should be left undisturbed as much as possible. Consequently, with the retention of adequate duff and woody debris, potential adverse impacts to long-term soil productivity are not anticipated.

Direct and Indirect Effects – Nutrient Loss – Alternative 3

Effects would be the same as described in alternative 2.

Direct and Indirect Effects – Nutrient Loss – Alternative 4

Effects would be the same as described in alternative 2.

Cumulative Effects – Nutrient Loss

Cumulative effects are discussed collectively for displacement, compaction, nutrient loss and instability at the end of the soils section.

3.9.3.4 Instability

Existing Condition – Instability

As was stated previously, this portion of the Upper North Santiam drainage is considered quite stable. Active slope instability from either debris chutes or slump/earth flow complexes does not occur. The recent intense rainstorms from 1996 to 2000 generated no instability in this project area.

Desired Future Condition – Instability

Slope instability is also a natural ecological component of the Cascade Range ecosystem. Debris chute failure recurrence is generally associated with more episodic large fire and / or flood events. Slump / earth flow instability is more steady state and may extend for centuries. Slope failures of either type carry large wood and rock to stream systems. This material is needed to both create suitable structure for sediment storage and provide the gravels required for fish and other aquatic habitat. On the other hand, numerous failures, without the associated boulder or log structure, can overload a system with sediment and degrade functioning aquatic habitat.

Activities which do not exacerbate existing unstable areas or promote long-term stability are favored.

Direct and Indirect Effects – Instability – Alternative 1

Slope instability is not a concern in this project area and would not change with or without timber management. This portion of the Upper North Santiam drainage is quite stable. The basalt bedrock and non-plastic glacial soils do not show any history of slope failure. Active slope instability from either debris chutes or slump/earth flow complexes do not occur. The recent intense rain storms from 1996 to 2000 did not generate any instability in this project area.

Direct and Indirect Effects – Instability – Alternative 2

Instability would not change with timber management as conditions are stable. Effects would be the same as described in alternative 1.

Direct and Indirect Effects – Instability – Alternative 3

Instability would not change with timber management as conditions are stable. Effects would be the same as described in alternative 1.

Direct and Indirect Effects – Instability – Alternative 4

Instability would not change with timber management as conditions are stable. Effects would be the same as described in alternative 1.

Cumulative Effects – Instability

Cumulative effects are discussed collectively for displacement, compaction, nutrient loss and instability at the end of the soils section.

Cumulative Effects – Displacement, Compaction, Nutrient Loss, Instability

For the soils resource the scale of analysis for both direct / indirect effects and cumulative effects is almost always the “unit”, i.e. the stand polygon proposed for silvicultural treatment. The unit of measure for evaluating those effects is generally considered the percent of the “unit” affected. At this time, no single unit measure of long-term soil productivity is widely used. Information on the survival and growth of planted seedlings may indicate short-term changes in site productivity. However, the relationship of short-term changes to long-term productivity is not fully understood. The major short-term impacts to soil productivity from harvest activity include displacement, compaction, nutrient loss, and instability. In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity. The total area of cumulative detrimental soil conditions should not exceed 20% of the total acreage within the activity area, including roads and landings.

The primary previous impacts to the soil resource from management are compaction. Existing compaction levels have been documented and discussed for the various units. The impacts are evaluated on a unit-by-unit basis, and are generally the same in any given unit for all action alternatives, unless otherwise noted. The soils mitigation measures are designed to limit the amount of additional compaction, and the subsoiling is intended to reduce compaction where levels would exceed standards and guides. The objective is to maintain long term soil productivity and provide a level of erosion control that is consistent with State guidelines. All prescriptions or mitigation measures discussed in this report are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Prescriptions for soil protection and watershed considerations take into account past and predicted future land management activities. With proper project implementation, as specified by the design criteria in chapter two, unacceptable cumulative effects on the soils resource are not anticipated from any of the action alternatives or the past present or reasonably foreseeable future actions listed in section 3.1 (BMP W-5).

3.10 Hydrology

3.10.1 Introduction

The proposed project can best be described as a low risk to no effect for hydrology, stream channels and water quality. A low risk to positive long term effect exists for the riparian reserves with the proposed action. The risks are low for this area due to the design criteria proposed for all action alternatives and the lack of water found in this area. Low stream densities are a result of highly permeable soil and gentle topography. Full riparian reserves have been established using interim widths, 150 foot standard tree height. Thinning within the riparian reserve is allowed to accelerate and promote long term characteristics needed by the dependent species utilizing the reserve.

Restorative actions have been proposed to restore the area and prevent further degradation from recreational users of sensitive and critical areas.

3.10.2 Analysis Methods

Field review included walking through and around the perimeter of the proposed units. Streams and wet areas encountered were recorded on either a map base or aerial photo. These were then transferred to integration maps for discussion and development of site specific prescriptions. Stability, slope, soil types, vegetation present, aspect, and juxtaposition of the unit were all considered in developing a prescription that protects and or enhances the hydrology, stream channels, water quality and riparian reserves found within the project.

Stream conditions, slope conditions and vegetation conditions were compared to information provided under the Upper North Santiam watershed analysis to determine if changes

occurred since the drafting of the WA. Conditions appeared to be responding typically for High Cascade environments. Nearby areas burned by 2 recent large-scale fires (6,000 and 90,000 acres), were reviewed to determine any offsite effects that could occur.

GIS analysis included stream density, road density, stand condition, (age), riparian connectivity, habitat types, weed locations, special habitat locations, fisheries habitats, among others to evaluate the proposed actions at site and 5th field scale.

3.10.3 Desired Future Condition

Conditions desirable for hydrology, stream channels, water quality and riparian areas can best be described in a range of variability. This range has been established through time to represent the natural changes the various elements experienced during a wide variety of outside influences. Flood, drought, fire, wind, snow, ice, and land movement all play a natural role in determining the changes to these elements. Natural condition and social political drivers also contribute to the desired future condition. The following bullets are an attempt to discuss the hydrology, stream channel, water quality and riparian portion of this condition.

- Range of flow, discharge, which allow for a variety of species within riparian areas.
- Maintenance of wet areas and hyporheic zones, no net loss.
- Maintenance of flows within historic range, no artificial peaks that exceed range.
- Maintenance of channel conditions that represent natural range.
- Reduction of stream energies through channel complexity. (Adding structure into channel, riparian areas.)
- Broad range of diversity associated to the riverine systems
- Accumulation of woody material to mimic historic levels within riparian site.

3.10.4 Hydrology

Hydrology: “a science dealing with the properties, distribution; and circulation of water on the surface of the land, in the soil and underlying rocks and in the atmosphere” (Webster’s Ninth New Collegiate Dictionary, 1988).

Existing Condition – Hydrology

Actions that could potentially impact water quality include: 1) increase in stream sedimentation and storage, 2) increase in water temperature, 3) increase in water yield, 4) increase in peak flows and change in timing of peak flows and 5) chemical changes in water quality from slash treatment (mainly burning).

Beneficial uses dependent on water quality are defined by the Forest Service Manual and include resident fish, aquatic non-fish species, riparian dependent species, water-related

recreation, water-related fire suppression and road maintenance needs. The clean water act requires the protection of downstream beneficial uses which must also be considered in our proposed action.

Average annual precipitation in the project area ranges from 80 to 150 inches, mainly snowfall, generally occurring between October and May. Units are proposed between the 3700 and 4500 feet elevation band in the transient snow zone (1200 to 4,900 feet). This zone may alternately receive snow or rain (Christner and Harr 1982). The closest prominent stream is to the west of the project area and is the North Santiam River. Named tributary streams include Downey Creek, and Meadows Creek.

The geology of the area has created coarse grained soils that are highly permeable. 80% of the units have drainage densities between 3-5 miles per square mile. Road densities range from 1 to 6 miles per square mile. It is apparent that roads influence the routing of water within the project area.

The stands in the project area are at hydrologic recovery for purposes of aggregate recovery percentage analysis. The aggregate recovery percentage accounting method compares the amount of an analysis area within the transient snow zone that is recovered against a threshold value (midpoint) that was calibrated for the area during development of the Forest Plan. The midpoint values were developed based on the soil, geology, vegetation, climate, and stream channel condition, by sub-drainage. These values were intended to represent a minimum safe level of vegetative recovery to prevent substantial alteration of peak flow regimes as a result of management activities. Recovery generally occurs when stand diameters average 8" dbh and crown closures exceeds 70%.

The existing water yield and base stream flow within the project area are within the expected natural range of variability. The North Santiam headwaters planning sub-drainage is 86 percent recovered and Marion Creek planning sub-drainage is 92 percent recovered. Mid-point ARP threshold levels, from the Willamette National Forest Land and Resource Management Plan (Appendix E-21), for these planning sub-drainages are 65 and 70 percent, respectively. Under the Forest Plan, midpoint levels are important as they determine the target value for a planning subdrainage. The risk of potential degradation of channel conditions is evaluated based on current and midpoint aggregate recovery percentages.

Environmental Consequences – Hydrology

Direct and Indirect Effects—Alternative 1 – Hydrology

Implementation of alternative 1, no action alternative, maintains the existing hydrologic conditions for approximately 20- 30 years. After this time period tree growth would be such that summer flows would be reduced as a result of the vegetation utilizing available ground water found in the over story removal units. Existing conditions would change in stands proposed for thinning due to competition and the loss of stand vigor and ability to utilize available water. It is not expected that a net change would occur due to the dynamics of these two factors. Higher likelihood of reduced tree health occurs and the ability of crowns to intercept and hold snow

decreases resulting in greater risk for tree damage (breakage) through the accumulation of snow loads. Infiltration rates could be affected by the loss of canopy and the drip that occurs from snow interception. Latent heat would remove the snow and not allow for the water to infiltrate in the same manner or at the same rate that would occur within a healthy canopy. (Reduced canopies are more exposed to latent heat transfer and rapid snow loss. This reduces the contact time the water stored in the snow has with the soil.) (Harr 1981). On the whole no net change of flow volumes would be anticipated while changes in the timing of flows may occur.

Direct and Indirect Effects—Alternative 2 – Hydrology

The new road construction and reconstructed roads would not be rocked and are designed for dry weather haul. Reconstruction of the system roads would reestablish drainage and improve the condition of the road system while reducing the vegetation and interception associated to these roads. When connected to the natural drainage network, roads lead to quicker delivery of runoff to stream networks. This could potentially lead to lower low flows (and higher peak flows) as a result of some water bypassing the normal routing (drainage) pathways (Pike and Scherer 2003). Landings associated with these reconstructed roads would add an additional 22 acres (estimated 0.2 acres per landing) of openings.

Stand treatment consist of shelterwood overstory removal, shelterwood, regeneration with reserves and thinning to 50 percent canopy closure. Consequences to hydrology would occur on the thinning stands in response to reduced competition for light, water, and nutrients. Increases in snow accumulation on the thinned acres, roads and landings would occur from the loss of vegetation. A short term (5-10 years) increase in discharge during the wet and the dry periods would occur from two mechanisms for the thinned stands. Increased snow accumulation (wet period) would create small increases in peak flows (Jones, and Grant; 2001), and reduced canopy (dry periods) would reduce transpiration rates which would account for small increases in summer flows. It is not anticipated that either of these changes would create detrimental effects (Pike and Scherer 2003).

Consequences to hydrology for the shelterwood and clearcut portions, 36 acres total, would be the loss of canopy for 35-45 years and the increase of snow accumulation on these acres. Increase in water table levels associated with these acres would occur due to the lack of vegetation pumping the water off the site. A potential increase in temporary (5- 20 years depending upon climate) wet areas would likely occur due to this increase in available water until such time that vegetation is reestablished and is utilizing available water.

In existing shelterwood stands the effects to hydrology were considered when the stand was initially harvested. For hydrology, the creation of shelterwood stands has the same effect as regenerating the stand. For this reason, harvesting the remaining shelterwood as part of a final shelterwood overstory removal will not have an additional effect to the hydrology of the area.

Ground based systems tend to have a higher risk of encountering ground water and bringing it to the surface. Capturing water and routing it down a different path could occur from the use of ground based yarding equipment, processor forwarder, tractor, or shovel. 1,642 acres

of ground base yarding is proposed. Thinning selected portions of riparian reserves places the equipment within closer proximity to drainage networks and a greater risk of routing water out of its historic flow routes. To minimize the risk a buffer would be established along all streams and designated skid roads and crossing would be required. This has effectively worked in past thinning sales. Unit design minimizes the risks of routing water out of historic flow patterns, by designating skid trails within the timber sale contract. Provided best management practices, as out lined in the integrated prescription, are followed it is not anticipated that detrimental hydrologic downstream effects would occur as a result of implementing this alternative.

Direct and Indirect Effects—Alternative 3— Hydrology

Landings associated with reconstructed roads would add an additional 10 acres (estimated 0.2 acres per landing) of openings. Selected portions of riparian reserves would be thinned depending upon the existing stand characteristics and future objectives. Similar effects and outcome exist as described in alternative 2 for hydrology provided the best management practices are implemented. Alternative 3 has an even lower risk than alternative 2 due to the reduction of 36 acres of clearcut and shelterwood and 834 acres of shelterwood overstory removal.

Provided best management practices, as out lined in the integrated prescription, are followed it is not anticipated that detrimental hydrologic downstream effects would occur to the beneficial uses as a result of implementing this alternative.

Direct and Indirect Effects—Alternative 4 – Hydrology

Landings associated with these reconstructed roads would add an additional 16 acres (estimated 0.2 acres per landing) of openings. No riparian reserves would be entered as this activity is a final removal. Full interim widths of 150 feet, would be adjacent to all streams found in the area. No fish bearing streams are in the area. Currently the overstory trees intercept minor amounts of snow due to their canopies being discontinuous. Removal of these trees creates a risk of compaction bringing water to the surface and reducing permeability during the physical process of removal. As stated in alternative 2 this risk is reduced by utilization of best management practices and the retention of full riparian reserve buffers. Clearcut and shelterwood effects have been described in alternative 2.

Provided best management practices, as out lined in the integrated prescription, are followed it is not anticipated that detrimental hydrologic downstream effects would occur to the beneficial uses as a result of implementing this alternative.

Table 3-24 Comparison of Effects for Hydrology

Comparison Factor	Alt 1	Alt 2	Alt 3	Alt 4
Acres Shelterwood Overstory Removal	0	889	0	889
Acres Commercial Thinning	0	779	779	0
Acres Ground Based Logging	0	1642	0	863
Acres Skyline Logging	0	26	0	26
Acres Helicopter Logging	0	0	0	0
Miles Construction of Temp Spur Roads	0	0.6	0.2	0.4
Miles Temporary Road Reconstruction	0	3.5	0.5	3.0

Cumulative Effects – Hydrology

Traditionally, projects involving timber harvest on the Willamette National Forest are analyzed for their cumulative impact on the quantity and timing of peak flows and water yields, using an Aggregate Recovery Percentage accounting method. As a result of current vegetative conditions of Upper North Santiam and Marion planning subdrainage, and the amount of wilderness associated with the planning subdrainages both exceed their midpoint threshold by more than 20 points. This means that the planning subdrainages are well recovered and cumulative effect are not anticipated. It is not anticipated that this action or any reasonably foreseeable future action would create an adverse downstream effect on hydrologic functions.

Flow changes anticipated are well within the variation of normal flows and should not generate a condition that the channel has not responded to through time. Short term changes may be evident in the time of the peak and the duration of flow throughout the year due to changes in transpiration rates and routing of flows yet these changes are short lived until such time that the stand closes canopy and utilizes the available water for the site. With the areas recovery percentage being so high, these effects would be immeasurable and therefore not anticipated to be adverse.

Table 3-25 Changes in ARP by Alternative

Planning Sub-Drainage	Existing ARP Level	Forest Plan Midpoint	Alt 2 (Ac)	ARP Alt 2 (% change)	Alt 3 (Ac)	ARP Alt 3 (% change)	Alt 4 (Ac)	ARP Alt 4 (% change)
Upper North Santiam	86.4%	65%	1648	-1.07%	759	-1.07%	889	-1.10%
Marion	92.2%	70%	20	-0.03%	20	-0.03%	0	0
Total	NA	NA	1668	-1.10%	779	-1.1%	889	-1.10%

Conclusion – Hydrology

While alternatives vary in acreages and prescriptions the overall effect to hydrology is similar. Design criteria were utilized to minimize any effect that may occur to hydrology in all alternatives and the area is not water rich.

With the current vegetative conditions of Upper North Santiam and Marion planning subdrainage, and the amount of wilderness associated with the planning subdrainages both exceed their midpoint threshold by more than 20 points. This means that the planning subdrainages are well recovered and cumulative effect are not anticipated. It is not anticipated any alternative proposed under this project with their accompanying design criteria would create an adverse downstream hydrologic effect.

3.10.5 Stream Channels

Stream “A body of running water flowing on the earth”) **Channels** (“the bed where a natural stream of water runs” (Webster’s Ninth New Collegiate Dictionary, 1988).

Existing condition – Stream Channels

The historic morphological characteristics of stream valleys in Presley Twin project area are similar to existing conditions. The basic stream patterns and channel gradients are largely influenced by the underlying geology. The channels have not changed a great deal since the reference time frames, 100 years ago. Channels form within the new cascades as a result of overland flow. Channels tend to be low gradient due to the old lava flow and glaciations that created the landscape. Channels have shallow banks in these areas and are very erosive due to the low clay content found in the soils. As gradients increase channels exhibit a gully type character. Boulders and cobble are recruited to its bottom as a result of channel bank erosion and portions of the substrate are scoured to bedrock. Seasonal flows shape the channels along with

frost heaving and wood material. Vegetation occupies the near stream zone and its roots provide resistance to erosion within the channel. Low gradients provide for sediment storage through deposition. Sediment stays in the stream longer due to its coarse grain size and the lack of stream energy to mobilize. Wood provides additional sediment storage in the channel by reducing water energy.

During peak storm events, channels tend to flow across the forest floor and create multiple braided channels. This creates multiple intermittent channels that lend themselves to riparian dependent organisms.

Environmental Consequences – Stream Channels

Direct and Indirect Effects – Alternative 1 – Stream Channels

Implementation of alternative 1, no action, would maintain the stream channels in their current conditions. With no action it is anticipated that a low risk of artificial disturbance mechanisms, road crossings, pipe installations, etc., would occur. Indirect affects could occur if riparian stands decline to a point of increasing the wood load into the stream and creating accelerated bank erosion. These channels do utilize the available wood and create small wetlands associated with the channels. A very low risk from increased wood is anticipated.

Direct and Indirect Effects – Alternative 2 – Stream Channels

Implementation of alternative 2 is designed to ground base log 1642 acres. During this activity a moderate risk of capturing water and creating additional channels exists. Each of the units utilizing ground based systems has their own complexities and would for the most part be yarded away from stream courses/ channels. It is important to note that the design of the unit has taken into consideration the streams locations and yarding requirements to reduce and or eliminate any disturbance to the stream channel's bank.

Under this alternative, intermediate wood would be lost due to the removal of material from the riparian reserve areas. Removal of these thinned trees would allow for faster growth of large wood debris which may be naturally added to the stream in the future. This wood is utilized in the regulation of flows and creation of sediment storage areas within the channel. Loss would create an intermediate term, 10 to 30 year period, that wood would not be recruited into the channel thorough the natural thinning of the stand. Channel response to this loss of wood varies depending upon the specific site, however in general it is anticipated that additional energy would be available and channel storage would be reduced. Areas of deposition currently could transition to transport reaches due to the increase energy. Increases in energy would work channel banks and create channel cross-sections capable of handling higher flows. Having stated the above it is important to note that due to the height of the trees being thinned, a very low, less than 1 percent of the time, risk is involved with this action. No harvest buffers have been established along all streams which would allow for recruitment of near stream wood. Treated areas within the riparian reserve are anticipated to have a positive long term, >50 years, effect on the wood recruitment by allowing for taller and larger trees to be developed.

In considering the above, a low risk of downstream effects exists due to the mitigations prescribed for each of these units. Stream channels should remain within their natural range of variability and the proposed project is not anticipated to create any long term detrimental effect as a result of the action. Short term effects would be associated to the designated crossings and would be short lived, gone after the first storm event that provides sufficient flow to flush the channel. Loss of wood structure for the intermediate term would be off set through the creation of larger wood for the long term. Due to the dynamic nature of channel morphology this action is not anticipated to create a measurable difference in the channel conditions or have any measurable effect on downstream beneficial uses.

Direct and Indirect Effects – Alternative 3 – Stream Channels

The stands proposed for treatment in this alternative consist only of the thinning stand proposed in alternative 2. Effects discussed in alternative 2 for these thinning stands are similar under this alternative. The main differences between alternative 2 and 3 are: the 0.4 mile reduction in new road construction, 3 mile reduction in reconstruction of existing roads.

Canopy density would be reduced and potential additional snow accumulation would occur for the short term 5-10 years. Stream channels would not show any effect resulting from this change due to the permeability of the soils and the low gradient slope of the stands. Seventy percent of the ground has a slope gradient of 30 percent or less. It is not anticipated that this alternative would create a measurable difference in the channel conditions or have any measurable effect on downstream beneficial uses.

Direct and Indirect Effects – Alternative 4 – Stream Channels

The stands proposed for treatment in this alternative consist only of the shelterwood overstory removal, regeneration, and shelterwood stands proposed in alternative 2. Effects discussed in alternative 2 for these shelterwood overstory removal stands are similar under this alternative. The main differences between alternative 2 and 4 are: the reduction in new road construction by 0.2 miles (1,050 feet), reduction in reconstruction by 0.5 miles (2,640 feet) of existing roads.

Effects to canopy density and channel conditions are the same as alternatives 2 and 3. It is not anticipated that this alternative would create a measurable difference in the channel conditions or have any measurable effect on downstream beneficial uses.

Cumulative Effects– Stream Channels

Effects of a cumulative nature are those effects which independently do not pose a risk to water quality yet, when added together may have some measurable effect on water quality. Cumulative effects analysis is framed by the two planning subdrainages and the 5th field HUC that the project area falls within. Planning subdrainages were utilized to meet LRMP objectives and 5th field HUC area was utilized to meet NWFP requirements. Looking at the watershed condition types for streams found within the project area, determines what management prescriptions should be followed (Page E-10 to E-17; LRMP). “This criterion is intended to address the potential for changes in peak flows during rain-on-snow events, and the associate potential change in the stability of the stream banks and streambed” (LRMP pg. E-6). The watershed is characterized as

condition type 1 and as a result no recommended aggregate recovery percentage is necessary (LRMP; pg. E-10-12). Upon reviewing these criteria and the streams involved in this project it is anticipated that cumulative effects could only occur as the result of not adhering to prescribed best management practices. This judgment is due to the condition of the channels and the topography and soil types found in the project area.

In reviewing the reasonably foreseeable future projects found within the project record it is anticipated that the proposed action along with these foreseeable future actions would not generate an adverse cumulative effect under all alternatives. Due to the protection requirements proposed for each stream channel, potentially ground disturbing activities are anticipated to maintain or improve channel conditions and minimize offsite effects.

Conclusion – Stream Channels

In considering all the alternatives individually and cumulatively it is anticipated that, a low risk of downstream effects exists from the actions proposed. Design criteria prescribed for each of these units reduces the risk to the stream channel. Stream channels should remain within their natural range of variability and the proposed project is not anticipated to create any long term detrimental effect as a result of the action. Short term effects would be associated with the designated crossings and would be short lived, gone after the first storm event that provides sufficient flow to flush the channel. Loss of wood structure in the intermediate term would be offset in the long term by the creation of larger wood. Due to the dynamic nature of channel morphology these actions are not anticipated to create measurable differences in channel conditions or have any measurable effect on downstream beneficial uses. This would hold true for the two planning subdrainages and the 5th field HUC that the project area falls within.

3.10.6 Water Quality

Existing Condition – Water Quality

Beneficial uses dependent on water quality are defined by the Forest Service Manual and include resident fish, aquatic non-fish species, riparian dependent species, water-related recreation, water-related fire suppression and road maintenance needs. The clean water act requires the protection of downstream beneficial uses which must also be considered in our proposed action. Water quality parameters critical to beneficial uses are temperature, type and timing of sediment input and chemical contaminants. No streams are listed under 303(d) classification with the State of Oregon within the project area.

Natural sediment loads are low for the area due to the topographic characteristics, channel gradient, soils and hydrology. Turbidity during large storm events is below 10 nephelometric turbidity units or NTU's and, during regular storm events is less than 5 NTUs. Nephelometric turbidity units are a standard measure of turbidity which describes the amount or type of sediment moving in the water at any given time. Water quality is therefore extremely

high. Turbidity and sediment loading conditions are similar to conditions that have existed over the past 100 years. During this time, periods of lower water quality resulted from stand replacement fires burning entire head waters of existing stream channels.

Direct and Indirect Effects –Water Quality– Alternative 1

Implementation of alternative 1, no action, would maintain the stream channels in their current conditions and therefore maintain current water quality. With no action it is anticipated that a low risk of artificial disturbance mechanisms, road crossings, pipe installations, etc., would occur. Indirect effects could occur if riparian stands decline to a point of increasing the wood load into the stream and creating accelerated bank erosion and creating short term, season migration of sediments. These channels do utilize the available wood and create small wetlands associated with the channels. A very low risk to water quality exists as a result of any changes that might occur from stream channel changes. The proposal also includes some restorative type of work to road drainage and wetland areas. Under the no action these projects would not occur. Additional sediments could become available into the aquatic system, but, are anticipated to be at the current existing level of input.

Direct and Indirect Effects — Water Quality – Alternative 2

Effects to water quality could occur with increases in inputs as the result of the timber sale. These inputs could be as varied as contaminants from petroleum products, sediment or solar radiation. All of these could have an adverse effect of the quality of water within the project area.

To reduce and minimize these potential effects, no cut buffers were placed along all streams to protect water quality. No cut buffers of 50 to 150 feet were placed along perennial streams. All intermittent and ephemeral channels were protected through the maintenance of trees attributing to channel bank stability or by designating 50-150 foot no cut buffers. Replacement of culverts and stream crossings would cause an increase in the amount of material and subsequent sediment loading to the stream after the new structures weathered their first storm event. Mobilized materials would be large and would fall out prior to reaching a confluence with a higher order stream. Minimal, if any, downstream effects would occur as a result of the proposed activity. Implementation of alternative 2 is designed to ground base log 1642 acres. During this activity a low risk of impacting water quality exists due to the prescribed buffers and the best management practices utilized and the minimal effect. Effects would be based upon the amount of sediment reaching the channel through various disturbance mechanisms (e.g. falling of trees, yarding, replacement of culverts, etc.). Prescriptions were developed to minimize and any potential of these effects on water quality.

Direct and Indirect Effects — Water Quality – Alternative 3

Effects to water quality could occur as the result of the timber sale under this alternative similar to Alternative 2. These inputs as in Alternative 2 could be as varied as contaminants from petroleum products, sediment or solar radiation. All of these could have an adverse effect of the quality of water within the project area. Similar effects to Alternative 2 would occur with a reduced risk due to the reduction in acres being affected. Only the thinning stands would be entered. With a low to minimal effect to water quality under alternative 2, alternative 3 would have approximately 30 percent less effect (Roads 40% + Thinning 30% + Shelterwood Removal 30% = 100% effect under alternative 2).

Direct and Indirect Effects — Water Quality – Alternative 4

Discussion for alternative 4 would be similar to alternative 2 and 3 with the main difference being the change from alternative 3 of the stand being entered. Shelterwood removal stands would be entered under this alternative. A 30 percent reduction in effects would exist from alternative 2 by eliminating the thinning stands yet the effect would remain low and minimal.

Cumulative Effects – All Action Alternatives – Water Quality

Water quality cumulative effects would be similar to the hydrology discussion. Cumulative effects analysis is framed by the two planning subdrainages and the 5th field HUC that the project area falls within. Planning subdrainages were utilized to meet LRMP objectives and 5th field HUC area was utilized to meet NWFP requirements. The effect of all the activities that would occur under this proposal is tempered by the timing of the action in relation to the recovery of the stands, and the buffers required. With full leave riparian buffers, primary shade zone, and channel bank stability would be maintained through protection of rooting zone, water quality impacts are anticipated to be minimal if any. Provided the Best Management Practices prescribed in this report are met, it is not anticipated that adverse cumulative effects would occur as a result of this project to water quality.

Restorative actions proposed under the opportunity section of this report create a connected action that could create a cumulative effect. These actions include sub-soiling, fuel treatment, traffic control, erosion and drainage control along the 2257 road, revegetation of landings, forage seeding, dispersed site restoration, and rehabilitation of old mountain bike trails. Water quality effects can be described as short-term and long-term. After the first flushing flow in the fall, additional sediment would be available in the short term as a result of drainage control work, culvert inlet cleaning, construction, and road work. This sediment would be coarse grained and fall out quickly downstream. Long-term effects would be reduced sediment availability and improved vegetation cover due to maintenance of roads. All other actions in association with the proposed action would reduce off site erosion by improving ground cover or controlling traffic.

Water quality would remain high and no adverse cumulative effects to downstream beneficial uses would occur as a result of these actions.

Conclusion – Water Quality

A low risk of downstream effects to water quality exists due to the design criteria prescribed. Water quality should remain high and the proposed project is not anticipated to create any long term detrimental effect as a result of the action. Short term effects associated with designated crossings would be short lived, localized and gone after the first storm event that provides sufficient flow to mobilize substrate material in the channel. Due to the design criteria, soil types and topography, measurable differences in water quality are not anticipated nor are any measurable effect on downstream beneficial uses expected.

3.10.7 Riparian Reserves

Existing Condition

Riparian reserves for this project area are based on the interim widths established in the Northwest Forest Plan. Widths vary depending upon the height of the potential site tree. Units fall within the pacific silver fir and mountain hemlock plant associations and contain a 150-foot slope distance riparian reserve (one potential site tree height) for class III and IV streams (300 feet total, including both side of stream).

Because stream densities are so low in this area, riparian reserves become critical connectors to the upland Cascades. Due to the high permeability and porous nature of the soils overland flow is minimal. Perennially flowing streams are limited in number, which places even more importance on the perennial wetlands or streams found within the landscape. East west connector corridors are associated with stream patterns and wet areas provided the greatest diversity in the landscape.

Direct and Indirect Effects –Riparian Reserves– Alternative 1

Implementation of alternative 1, no action, would maintain the riparian reserves in their current conditions. With no action it is anticipated that stands will continue to slowly degrade due to competition and self thin. Indirect affects could occur if riparian stands decline to a point of increasing the wood availability to insects and disease which would then cause the live portion of the stand to become susceptible. Treatment will affect the timing of restoring stand health by removing competition (thinned trees) for nutrient and light from the thinning stands. Shelterwood stands will continue to develop with a multiple canopy and a large overstory.

Direct and Indirect Effects –Riparian Reserves– Alternative 2

Management within these reserves is being proposed to accomplish a multitude of resource benefits. These reserves would develop the characteristics of structure, openings and down

wood naturally; however, development of these characteristics could be expedited with selective management. Direct and indirect effects to the riparian reserves are a compilation of the hydrology, stream channel, water quality, aquatic and terrestrial wildlife components and are discussed under these headings within this report. Reserves being entered under this alternative are only those stands that are being thinned. Shelterwood removal, Shelterwood, and regenerated proposed stand all contain full 150 foot riparian reserves.

Areas where management would improve the long-term objectives for the riparian reserves were identified. Unit design criteria developed by the interdisciplinary team directed the management action and the protection needed to accomplish resource goals. Not all areas warranted management at this time. Some are developing needed characteristics naturally. Management of the riparian reserves would protect and enhance the aquatic and wildlife dependent species and achieve the Aquatic Conservation Strategy Objectives (ASCO's) at the 5th field, project and landscape levels. Each of the nine Aquatic Conservation Strategy Objectives addressed in appendix E.

Effects to the riparian reserve will be short termed and will consist of ground disturbance from removal of material, increased solar radiation to parts of the reserve which tends to dry the area out until such time canopies close and microclimates are reestablished and change in small wood recruitment. For the thinned areas it is anticipated that increases in solar radiation could persist for 10 years, ground disturbing activities 2-5 years and small wood recruitment 15 to 20 years.

Direct and Indirect Effects –Riparian Reserves– Alternative 3

Effects to the riparian reserve will be short termed and will be similar to alternative 2. Under this alternative only the thinning stands will be entered. It is these stand that riparian reserves are being entered. See alternative 2 for discussion.

Direct and Indirect Effects –Riparian Reserves– Alternative 4

Under this alternative no riparian reserves will be entered other than existing roads see alternative 1 discussion for the effects of this alternative.

Cumulative Effects – Riparian Reserves

Cumulative riparian reserve effects for all alternatives are similar. Cumulative effects analysis is framed by the 5th field HUC that the project area falls within. The 5th field HUC area was utilized to meet NWFP requirements. The cumulative effects are discussed in sections 3.10.4, 3.10.5 and 3.10.6 cumulative effects portions of this document. Effects are also addressed in the wildlife, fisheries, botany, and soils sections of this document. The overall 5th field scale tends to dilute cumulative effects and create a more diverse landscape. Management within the

riparian reserve area is not anticipated to create any long term detrimental effect as a result of the action.

Conclusion – Riparian Reserves

In considering all the alternatives individually and cumulatively it is anticipated that, a low risk of degradation, temperature fluctuation and extreme peak flow events exists for riparian reserves due to the mitigations prescribed. Long term benefits are anticipated as a result of the action with the creation of additional diversity and recovery of stands. Due to the stream density and juxtaposition of the reserves on the landscape all action alternatives protect the critical areas associated with the riparian reserves and manage those areas where the greatest benefit occurs for riparian dependent resources. Upon reviewing the 9 ACSO individually for the 5th field HUC it was determined that the proposed project is in compliance with the direction stated under the North West Forest Plan (See appendix E for Aquatic Conservation Strategy Objectives compliance information).

3.10.8 Conclusion and Rationale

In looking at the direct and indirect effect for hydrology, stream channel, water quality and riparian reserve, it is not anticipated that any of the effects would be detrimental or create substantial downstream effects. The critical elements in the maintenance of hydrology, stream channels, water quality and riparian reserves in the project area are the existing riparian areas. Provided these riparian areas are maintained in a healthy state the stream systems would obtain their desired future condition. Future management activities are considered in the long term objectives for riparian areas of perennial and intermittent streams. Long term riparian objectives are considered along with other resource goals and objectives agreed to by the interdisciplinary team. Stream-side management prescriptions are designed to maintain Aquatic Conservation Strategy Objectives, as defined in Willamette's LRMP to meet these long term objectives.

Floodplains are minor if nonexistent in the project area. No activities would occur within flood plains due to the maintenance of riparian reserves and buffer restrictions. Wet areas were dealt with on an individual basis under the stand specific recommendations. Wetlands less than 1/4 acre would be treated as special habitat areas and buffered (FW-211). These activities meet best management practices and federal and state water quality objectives.

3.11 Fisheries

3.11.1 Introduction

The project area is located on a topographically flat part of the district where soils are well drained with high infiltration rates, so overland flow generally occurs during spring runoff. Meadows Creek and Downing Creek are the two perennial streams in the project area, but natural passage barriers prevent fish presence. Because there are no fish bearing streams in the

analysis area, the mechanism for effect to the fisheries resource is related to effects that can be transmitted downstream to fish bearing reaches. In this case the mechanism of effect is fine sediment input and transport, and water temperature.

Offsite erosion from harvest activities including: yarding, slash treatment, and road construction and maintenance is not expected because of the vegetative ground cover, the high infiltration rates, and the gentle side slopes (Soils Report). Implementation of riparian buffers and best management practices would further reduce the probability of sediment transport to stream channels in areas of streams which have fish. Fine sediment that is routed to stream channels is expected to remain localized and not reach the next stream order (Hydrology Report). The small magnitude of sediment input and distance to fish bearing reaches make the probability effect to MIS resident fish and ESA listed spring Chinook salmon negligible and discountable.

There would not be over story harvest in the primary shade zone, which would reduce the effect of timber harvest to the temperature indicator. Stream channels in the project area originate from and collect spring water, which further reduce the probability of effect to water temperature in the sub-watershed. There would be no effect to the temperature indicator in the fish bearing reaches of Meadows Creek, Downing Creek, or the North Santiam River as a result of this project.

3.11.2 Regulatory Framework

- Aquatic Conservation Strategy Objectives
- Best Management Practices
- Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1996,
- Wild and Scenic Rivers Act
- Executive Orders 12962, 11988, and 11990

3.11.3 Analysis Methods

Resource Data

Stream habitat and biological surveys were completed in 1993 and 1994. There are no fish bearing streams within the project area. Electro-fishing surveys were completed to confirm the current upper limit of fish presence in Meadows Creek and Downey Creek. Rainbow trout, cutthroat trout and sculpin were found in the lower 1 mile of Meadows Creek; a bedrock chute and a culvert on the 2261 road end fish presence. The combination of a concrete box culvert at highway 22 and subsurface flow of Meadows Creek near the mouth prevent Chinook passage. A series of natural falls a near river mile 0.58 of Downing Creek is the upper limit of fish presence.

The Upper North Santiam Watershed Analysis (WNF 1995) was reviewed to gain the larger scale historical background condition and identify concerns with existing natural watershed processes and watershed recommendations.

Existing data from the Willamette National Forest Geographic Information System (GIS) database was queried to provide values for road density, acres historically treated, riparian reserve condition, and historical and current fish distribution.

IDT input from hydrologist, soil scientist, wildlife biologist, silviculturalist, fuels planners, logging system planners, and engineers was reviewed.

The project area was surveyed by Darren Cross, district fishery biologist, during the project planning stage. Streams within the project area were sampled to confirm existing distribution records, confirming fish presence/absence, and species composition.

Critical habitat and ESA fish distribution maps from NMFS were reviewed.

Scale of Analysis

Site scale analysis would focus on the effects to the nearest stream channel and effects to fish would be the accumulated effects in the nearest fish bearing stream reach. In this case, the fish bearing reaches are outside of the project area in Meadows Creek, Downing Creek, and the North Santiam River. Therefore a sub-watershed scale analysis is best suited for determination of effects of this project on the fisheries resource.

Direct and indirect effects of the project focus on the Straight Creek sub-watershed (HUC 6, 170900050102) because that is where more than 99% (5,864 acres) of the project would occur. Less than 1% (277 acres) of the project area is located in the Marion Creek sub-watershed (HUC6, 170900050103). Due to the small land area and ridge top location, there is no probability of effect to fish or water quality in Marion Creek sub-watershed, so effects are not further analyzed in this report. Cumulative effects to fisheries would also be assessed for the Straight Creek sub-watershed.

3.11.4 Existing Condition – Fisheries

The Upper North Santiam River provides habitat for Chinook salmon, rainbow trout, cutthroat trout, naturalized sockeye salmon (commonly referred to as kokanee salmon), long-nosed and black sided dace, and sculpin. Historically, bull trout and steelhead were found in the Straight Creek sub-watershed. The North Santiam River provided spawning, rearing, and migration habitat, and the accessible portions of Meadow Creek and Downing Creek most likely provided rearing habitat. Naturally reproducing populations of bull trout and steelhead no longer exist above Detroit and Big Cliff Dams.

Spring Chinook salmon historically utilized the North Santiam River in the Straight Creek sub-watershed. Access to this habitat was eliminated in 1953 with the construction of Detroit dam, which does not provide upstream passage. Spring Chinook salmon, of hatchery origin, have been reintroduced above the dam, starting in the year 2000, with the capture, transport, and release of adult salmon. For the purposes of this analysis, it is assumed that the historically occupied habitat in the North Santiam River is currently being utilized by both adult and juvenile spring Chinook salmon.

The National Marine Fisheries Service (NMFS) recently completed their final listing determinations for 16 Evolutionary Significant Units (ESUs) of West Coast Salmon (70 FR 37160; effective August 29, 2005). They listed the Upper Willamette River Chinook salmon ESU as threatened under the Endangered Species Act (ESA), confirming their earlier determination (64 FR 14308; effective May 24, 1999). The Upper Willamette River Chinook ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon.

Artificially propagated spring-run Chinook salmon from seven hatcheries in the basin are also considered to be part of the ESU. This includes the Marion Forks Hatchery (ODFW stock # 21) on the North Fork Santiam River, the source for out-planted spring Chinook salmon above Big Cliff and Detroit dams, and potentially utilizing their historical habitat in Blowout Creek. The NMFS determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU.

The NMFS has designated critical habitat for 12 ESUs of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho (70 FR 52630; effective January 2, 2006). Designated critical habitat for Chinook salmon does not extend above Big Cliff dam, and would not be affected by this project.

Similarly, the Magnuson-Stevens Fishery Conservation and Management Act lead to the designation of Essential Fish Habitat (EFH) for commercially harvested fish, which includes Chinook salmon on the Willamette National Forest. Their designation of EFH did not include any streams above Big Cliff dam, and therefore EFH would not be affected by this project.

The FEIS for the LRMP identifies "Anadromous Fish" and "Resident Fish" as Management Indicator Species (Chapter III-69). There are no fish bearing streams or fish habitat within the project area. Downing Creek and Meadows Creek are the only perennial streams in the project area and both flow into the North Santiam River. Migration barriers in both streams prevent upstream passage of fish into the project area. In Meadows Creek the upstream limit is at RM 0.86 at a bedrock chute migration barrier west of the 2257 crossing. The upstream limit of fish presence in Downing Creek is 0.58 miles from the North Santiam confluence where natural falls occur.

3.11.5 Fish and Watershed Indicators (Habitat complexity, Water Quality and Biological Parameters)

Three primary indicators identified for assessment of effects to the fisheries resource on the Willamette National Forest include habitat complexity, water quality, and biological parameters.

These indicators incorporate the same diagnostics used in the matrix of pathways and indicators to make ESA determinations for federally listed fish (NMFS 1996 and USFWS 1998). A baseline functional rating of functioning appropriately, functioning at risk, or functioning at unacceptable risk is used to describe each indicator (Table 3-26). The existing condition, desired

future condition, and direct and indirect effects of project elements are then discussed for each of indicator. Because there is no fish habitat in the project area, this assessment focuses on the closest fish bearing reaches of the Straight Creek sub-watershed; North Santiam River Meadows Creek and Downing Creek.

Table 3-26 Definition of Functionality Terms

	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk
Habitat Complexity LWD, pools, off-channel habitat, substrate embeddedness, and flows	Habitat is functioning at or near historic levels and supports healthy fish populations	Habitat quality has been moderately reduced by past or current management activities	Severe reduction of habitat quality due to past or current management activities
Water Quality Temperature, sediment, turbidity and chemical contaminants	Indicators are functioning at better than state and federal standards	Indicators are functioning at minimum levels desired to be "functioning appropriately"	Indicators are out of compliance with state and federal standards
Biological Parameters Population size, growth and survival, life history and food source.	All life history stages are represented, and growth and survival supports resilient fish populations.	Moderate reduction of population size and survival rates.	Small isolated population with low survival rates.

3.11.5.1 Fish Habitat Complexity

Existing Condition – Fish Habitat Complexity

Fish habitat complexity is a measure of high quality pool habitat, % existing stream cover compared to off channel habitat refuge stream width/depth ratio, substrate and spawning habitat (embeddedness and surface fines). Fish bearing reaches in the sub-watershed are Functioning at Risk. Habitat complexity conditions in this sub-watershed, particularly the North Santiam River, were reduced due to past management (high intensity riparian timber management), stream "cleaning" (wood removal), The streams were also naturally affected by the high flows during the 1996 flooding. Highway 22 further reduces habitat complexity by preventing recruitment of sediment, including spawning gravel, and large woody debris to the North Santiam River. Management in the last decade has emphasized protection and restoration of streams and their riparian vegetation, and conditions outside of the highway corridor are expected to improve over

time. Passive (natural) restoration to the stream complexity potential may take a century or more.

Fish habitat in the in Meadows Creek and Downing Creek is negatively affected by past management activities as well. The North Santiam River has fair habitat in the Straight Creek sub-watershed because of past management activities, stream cleaning, and location of the highway have reduced habitat quality.

The natural barriers to fish migration in Meadow Creek and Downing Creek limit distribution of resident fish. In Meadows Creek, a concrete box culvert under highway 22 is a migration barrier to spring Chinook.

Desired Future Condition – Fish Habitat Complexity

Desired future condition for preferred salmonid habitat in Meadows Creek, Downing Creek, and the North Santiam River include:

- Reconnection of the floodplain and alluvial fans of Meadows Creek and Downing Creek near the North Santiam confluence.
- Anadromous fish passage in Meadows Creek.
- Increased stream complexity due to increased frequency of in stream and riparian Large Woody Debris (LWD).
- A reduction in the percent of the stream channel dominated by fine-grained sediment
- An increase in the gravel-sized material in the stream channel for spawning habitat.
- An increase in the frequency and quality of pool habitat.

Direct and Indirect Effects – Fish Habitat Complexity– Alternative 1

The hydrology and soils specialist reports for this project predict that this alternative would have minimal negative effects to runoff, water quality or soil erosion processes. Concerns were related to the non-treatment of forested stands and the subsequent increase over time in the fuel loadings, leading to more severe burning conditions if/when the area burns. Also, existing road systems would not be maintained at a high level, increasing the probability of failure and subsequent increased delivery of fine sediment to streams and fish habitat. No measurable downstream change to timing or volume of stream flows is expected with this alternative.

Most of the watershed is managed by the Forest Service, and degraded existing conditions would slowly recover over time, due to changed management practices, and protected stream riparian reserves. Passive restoration (protection) would likely result in long-term (100-300 years) recovery to desired future conditions.

The probability that non-treatment would result in negative effects to the fishery resource, with biological effects, reduced habitat complexity, or reduced water quality, is negligible.

Direct and Indirect Effects – Fish Habitat Complexity– Alternative 2

Alternative 2 was designed to minimize the negative effect to water quality, while still achieving the project objectives. The location of harvest units were selected to reduce the risk of slope failure, and streams were buffered to limit the probability of affecting stream shade, or allowing the down slope migration of disturbed soils. It includes stream protection buffers of 150 feet on either side of perennial fish bearing streams, 50 to 150 feet on either side of perennial non-fish bearing streams, 50 feet on either side of intermittent streams, and 50 to 150 feet for unstable headwalls and wetlands. These variable width buffers allow for the protection of stream shade, bank stability, and woody material contribution, while allowing for differing natural conditions observed during field reconnaissance and unit layout.

In this alternative the streams adjacent to units with regeneration and final shelterwood overstory removal of shelterwood would have a protection buffer of at least 150 feet, the full-width riparian reserve width as described in the NW Forest Plan.

Alternative 2 allows thinning harvest near stream channels. This harvest would remove some trees that could have potentially been recruited to adjacent stream channels as large woody material. All streams have a no-harvest protection buffer, with larger streams having a wider buffer. However, trees retained at high stocking levels within the protection buffers, residual trees left in treated units near streams, and the large acreage of untreated stands in the affected watersheds would leave an abundant supply of potential wood available for short-term and long-term recruitment to the stream network. Additionally, the thinning harvest would allow the residual trees to grow to a larger size more rapidly, and these trees would be healthier than if the stands were untreated.

Regeneration prescriptions associated with this alternative would not likely affect the wood recruitment potential for the watershed because the units are located on relatively stable slopes, and are therefore not likely to contribute wood to streams via slope failure and subsequent debris torrent mechanism. All streams are protected by full width riparian reserves, allowing for the retention of all direct input potential stream recruitment trees. Some harvesting is allowed in the outer portions of riparian reserves where it would benefit the Aquatic Conservation Strategy Objectives. It is likely that all alternatives would result in a negligible negative effect on wood recruitment potential, and be offset by a long-term, small-scale positive effect.

Alternative 2 prescribes 3 acres regeneration harvest and subsequent broadcast burning. This management is more intensive than the thinning prescriptions, and there is a slightly higher risk of affecting stream flows, and accelerated soil erosion with regeneration harvest. However, the full-width riparian buffers on streams adjacent to these units will likely reduce the magnitude of any site scale effect prior to being realized in the streams. ARP modeling results show that all alternatives will not drop below the concern thresholds and no measurable change in stream flow is predicted to occur.

It is not likely that the predicted change in sediment routing, due to the timber harvest, would result in any reduction in the quality of fish habitat complexity. No change in pool frequency or

pool quality is expected in the North Santiam River, Meadows Creek, or Downing Creek. Spawning substrate would remain available at existing levels.

Road work has the potential to affect sediment delivery rates to fish bearing streams, and alternative 2 requires temporary road construction and reconstruction. Alternative 2 would require road maintenance, opening of 3.5 miles of temporary roads and constructing 0.6 miles of temporary roads. Existing main haul routes out of the area are native surface with spot rock or paved. The new road construction and reconstructed roads are not rocked and are designed for dry weather haul. The lower 3.5 miles of the 2261 and 2.8 miles of the 2257 roads are paved eliminating the probability of sediment to fish bearing streams during timber haul. This work may result in a short-term increase in sediment delivery rates to stream channels. This short-term impact is typically offset by an immediate and long lasting reduction in road surface and ditch line erosion, due to the improved drainage and surfacing. Road work associated with Alternative 2 would have negligible negative effects to sediment delivery to fish habitat.

Large woody debris, bedrock, large boulders, and coarse and fine sediment are the channel forming features generally responsible for creating fish habitat complexity. Due to protection buffers and other best management practices as described in the watershed and soils specialist reports, the implementation of the action alternatives would have no effect to channel forming features and a negligible water quality or soils. Because these minor affects soil and water quality are more than 1.2 stream miles from fish habitat the probability of any affect to fish is negligible and discountable.

Direct and Indirect Effects – Fish Habitat Complexity– Alternative 3

Alternative 3 is a thinning only alternative. Thinning overstocked stands would allow residual trees to grow to a larger size more rapidly, and result in a healthier than if the stands were untreated. Alternative 3 would incorporate the same protection buffers to protect water quality as described in Alternative 2. Trees retained within the protection buffers, residual trees left in treated units near streams, and the large acreage of untreated stands in the affected watersheds would leave an abundant supply of potential wood available for short-term and long-term recruitment to the stream network. The thinning harvest in this alternative would allow the residual trees to grow to a larger size more rapidly, and these trees would be healthier than if the stands were untreated. There would be no effect to fish habitat complexity as a result of implementation of Alternative 3

Road work has the potential to affect sediment delivery rates to fish bearing streams. This short-term impact is typically offset by an immediate and long lasting reduction in road surface and ditch line erosion, due to the improved drainage and surfacing. Alternative 3 would require the same road maintenance and temporary less road reconstruction and reconstruction, 0.5 miles and 0.2 miles respectively. The temporary roads are not rocked and are designed for dry weather haul. Existing main haul routes out of the area are native surface with spot rock or paved. As in Alternative 2, this work may result in a short-term increase in sediment delivery rates to stream

channels, but protection buffers and distance to fish habitat reduces the probability of effect fish habitat or water quality. Road work associated with this alternative would have negligible negative effects to sediment delivery to fish habitat.

Large woody debris, bedrock, large boulders, and coarse and fine sediment are the channel forming features generally responsible for creating fish habitat complexity. Due to protection buffers and other best management practices as described in the watershed and soils specialist reports, the implementation of the action alternatives would have no effect to channel forming features and a negligible water quality or soils. Because these minor affects soil and water quality are more than 1.2 stream miles from fish habitat the probability of any affect to fish is negligible and discountable.

Direct and Indirect Effects – Fish Habitat Complexity– Alternative 4

Alternative 4 is the same as described in Alternative 2 without the thinning component. All streams are protected by full width riparian reserves, allowing for the retention of all direct input potential stream recruitment trees. Some harvesting is allowed in the outer portions of riparian reserves where it would benefit the Aquatic Conservation Strategy Objectives.

Alternative 4 prescribes 3 acres regeneration harvest, 52 acres of shelterwood overstory removal and subsequent broadcast burning. This management is more intensive than the thinning prescriptions, and there is a slightly higher risk of affecting stream flows, and accelerated soil erosion with regeneration harvest. However, the full-width riparian buffers on streams adjacent to these units will likely reduce the magnitude of any site scale effect prior to being realized in the streams. ARP modeling results show that all alternatives will not drop below the concern thresholds and no measurable change in stream flow is predicted to occur.

It is not likely that the predicted change in sediment routing, due to the timber harvest, would result in any reduction in the quality of fish habitat complexity. No change in pool frequency or pool quality is expected in the North Santiam River, Meadows Creek, or Downing Creek. Spawning substrate would remain available at existing levels.

Road work has the potential to affect sediment delivery rates to fish bearing streams. Alternative 4 would require similar amount of road maintenance and road reconstruction as Alternative 2. This work may result in a short-term increase in sediment delivery rates to stream channels. This short-term impact is typically offset by an immediate and long lasting reduction in road surface and ditch line erosion, due to the improved drainage and surfacing.

Alternative 4 requires temporary road construction and reconstruction. Existing main haul routes out of the area are native surface with spot rock or paved. The new road construction and reconstructed roads are not rocked and are designed for dry weather haul. Road work associated with alternative 4 would have negligible negative effects to sediment delivery to fish habitat. The lower 3.5 miles of the 2261 and 2.8 miles of the 2257 roads are paved eliminating the probability of sediment to fish bearing streams during timber haul.

Large woody debris, bedrock, large boulders, and coarse and fine sediment are the channel forming features generally responsible for creating fish habitat complexity. Due to

protection buffers and other best management practices as described in the watershed and soils specialist reports, the implementation of the action alternatives would have no effect to channel forming features and a negligible water quality or soils. Because these minor affects soil and water quality are more than 1.2 stream miles from fish habitat the probability of any affect to fish is negligible and discountable.

3.11.5.2 Water Quality for Fish

Cumulative Effects –Fish Habitat Complexity

See cumulative effects discussion later in the section.

Existing Condition – Water Quality for Fish

Water quality in the Straight Creek sub-watershed is good and was probably higher historically, but temperature and turbidity data suggest that it is **Functioning Appropriately**.

Water temperatures in the Straight Creek sub-watershed are cool and good for beneficial uses and fish production. Geology of the Upper North Santiam consists of permeable glacial material and basalt lava flows creating springs and cold water influences in the watershed. The watershed provides municipal water for the Santiam Canyon communities and the cities of Albany and Salem where water quality is touted as the best in the Northwest. The North Santiam River originates from glaciers and snowmelt in the Mt. Jefferson Wilderness in the high cascades as do many of its tributaries.

Desired Future Condition – Water Quality for Fish

The desired future condition for water quality includes:

- Water quality that remains within the range that maintains the biological, physical and chemical integrity of the system, and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
- Water flows sufficient to create and sustain riparian aquatic and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.
- Cooler summer water temperatures

Direct and Indirect Effects –Water Quality for Fish– Alternative 1

The hydrology and soils specialist reports for this project predicted that this alternative would have minimal negative effects to water quality or soil erosion processes.

The probability that non-treatment would result in negative effects to the fishery resource, with biological effects, reduced habitat complexity, or reduced water quality, is negligible. Increased fuel loadings would increase the severity of subsequent burning, but large

fires are relatively uncommon in the project area. The present high quality water quality would be maintained with implementation of this alternative.

Direct and Indirect Effects –Water Quality for Fish– Alternative 2

The harvest activities for this project were all designed to minimize the negative effect to water quality, while still achieving the project objectives. The location of harvest units were selected to reduce the risk of slope failure, and streams were buffered to limit the probability of affecting stream shade, or allowing the down slope migration of disturbed soils. This alternative provides for stream protection buffers of 150 feet on either side of perennial fish bearing streams, 50 to 150 feet on either side of perennial non-fish bearing streams, 50 feet on either side of intermittent streams, and 50 to 150 feet for unstable headwalls and wetlands. These variable width buffers allow for the protection of stream shade, bank stability, and woody material contribution, while allowing for differing natural conditions observed during field reconnaissance and unit layout.

Additionally, the streams adjacent to units with regeneration harvest will have a protection buffer of at least 150 feet on both sides of the stream, the full-width riparian reserve width as described in the NW Forest Plan.

Road work associated with this alternative has the potential to affect stream turbidity due to increased fine-grained sediment delivery to streams. This would possibly result in increased water turbidity levels during the first precipitation events following the road work. Turbidity changes are expected to be minor due to the best management practices in place, and should be short in duration. Mobilized sediment is expected to remain localized within the project area and is not expected to reach the next higher order stream confluence. No effect from sediment is expected in the fish bearing reaches in the Straight Creek sub-watershed.

Due to these protection buffers and other best management practices as described in the watershed and soils specialist reports, the implementation of the action alternatives are all expected to have only minor negative effect to water quality and soils. There is no fish habitat within the project area. The nearest habitat is in the North Santiam River 0.5 miles from the project boundary, and the lower 0.5 miles of Meadow Creek and 0.2 miles of Downing Creek. Because these minor affects are more than 1.5 stream miles from fish habitat the probability of any affect to fish is negligible and discountable.

Direct and Indirect Effects –Water Quality for Fish– Alternative 3

The affects to water quality for fish associated with alternative 3 would be less than to those in alternative 2 because there are only 0.5 miles of temporary road reconstruction and 0.2 miles of temporary road construction. Thinning would occur within the riparian reserve, but variable width buffers allow for the protection of stream shade, bank stability, and woody material contribution, while allowing for differing natural conditions observed during field reconnaissance and unit layout.

Due to the protection buffers and other best management practices as described in the watershed and soils specialist reports, the implementation of the action alternatives are all expected to have only minor negative effect to water quality for fish. There is no fish habitat within the project area. The nearest habitat is in the North Santiam River 0.5 miles from the project boundary, and the lower 0.5 miles of Meadow Creek and 0.2 miles of Downing Creek. Because these minor affects are more than 1.5 stream miles from fish habitat the probability of any affect to fish is negligible and discountable.

Direct and Indirect Effects –Water Quality for Fish– Alternative 4

Alternative 4 proposes to remove overstory with regeneration and shelterwood harvest. This alternative is the same as alternative 2, but without the thinning component. Streams channels adjacent to units with regeneration harvest will have a protection buffer of at least 150 feet on both sides of the stream, the full-width riparian reserve width as described in the NW Forest Plan.

Road work associated with this alternative has the potential to affect stream turbidity due to increased fine-grained sediment delivery to streams. This would possibly result in increased water turbidity levels during the first precipitation events following the road work. Turbidity changes are expected to be minor due to the best management practices in place, and should be short in duration. Mobilized sediment is expected to remain localized within the project area and is not expected to reach the next higher order stream confluence. No effect from sediment is expected in the fish bearing reaches in the Straight Creek sub-watershed.

Due to these protection buffers and other best management practices as described in the watershed and soils specialist reports, the implementation of the action alternatives are all expected to have only minor negative effect to water quality and soils. There is no fish habitat within the project area. The nearest habitat is in the North Santiam River 0.5 miles from the project boundary, and the lower 0.5 miles of Meadow Creek and 0.2 miles of Downing Creek. Because these minor affects are more than 1.5 stream miles from fish habitat the probability of any affect to fish is negligible and discountable.

Cumulative Effects –Water Quality for Fish

See cumulative effects discussion later in the section.

3.11.5.3 Fish Biological Parameters

Existing Condition – Fish Biological Parameters

Biological parameters include life history stages, population size, population density, and food supply. Although there are no fish bearing streams in the project area, habitat for spring Chinook and resident MIS occurs in the North Santiam River 0.5 miles from the project boundary, and the lower 0.5 miles of Meadow Creek and 0.2 miles of Downing Creek. Resident cutthroat trout,

rainbow trout, and sculpin are found in Meadow Creek and Downing Creek; all of which are **Functioning at Risk** because of past management activities. Spring Chinook use the North Santiam River in the Straight Creek watershed is dependant on hatchery supplementation and passage around Big Cliff and Detroit Dams. Biological parameters in the North Santiam River and tributaries in the valley bottom are **Functioning at Unacceptable Risk** due to reduced large wood recruitment and riparian habitat, past removal of wood, channelization and loss of floodplain connectivity associated with the location of Highway 22. Riparian areas outside of the influence of Highway 22 are intact and functioning appropriately for biological parameters.

Desired Future Condition – Fish Biological Parameters

The desired future conditions for biological parameters include:

- Continued representation of all life stages and spawning, rearing, and migration habitat types in the Straight Creek sub-watershed for all aquatic species.
- Year-round input of leaf, needle, wood and insect material from a variety of species provide a variety of food sources for salmonids and invertebrates.

Direct and Indirect Effects – Fish Biological Parameters– Alternative 1

The hydrology and soils specialist reports for this project predicted that this alternative would have minimal negative effects to water quality or soil erosion processes.

The probability that non-treatment would result in negative effects to the fishery resource, with biological effects, reduced habitat complexity, or reduced water quality, is negligible. Increased fuel loadings would increase the potential of large fires, but they are relatively uncommon in the project area.

Direct and Indirect Effects – Fish Biological Parameters– Alternative 2

The alternatives for this project were all designed to minimize the negative effect to water quality and riparian habitat, while still achieving the project objectives.

In Alternative 2, stream protection buffers and best management practices would be implemented as described in the watershed and soils specialist reports. This alternative is expected to have only minor short-term negative effect to water quality and soils. Because these minor affects are more than 1.2 stream miles from fish habitat the and relatively intact riparian areas downstream of the harvest units the, probability of any affect to fish is negligible and discountable.

The implementation of alternative 2 is not expected to result in any measurable change in the survival rate, distribution, or population size of any resident or anadromous fish species within the analysis area. Riparian areas and large wood recruitment would be protected by stream buffers, and project distance from fish bearing streams reduces the chance of affect to a negligible level. Downstream affects of sediment routing from harvest and road maintenance activities would have no effect on biological parameters.

Direct and Indirect Effects – Fish Biological Parameters– Alternative 3

The implementation of alternative 3 is not expected to result in any measurable change in the survival rate, distribution, or population size of any resident or anadromous fish species within the analysis area. Downstream affects of sediment routing from harvest and road maintenance activities would have no effect on biological parameters because of the distance to fish habitat. Riparian areas and large wood recruitment would be protected by stream buffers, and project distance from fish bearing streams reduces the chance of affect biological parameters to a negligible level.

Direct and Indirect Effects – Fish Biological Parameters– Alternative 4

The implementation of alternative 4 is not expected to result in any measurable change in the survival rate, distribution, or population size of any resident or anadromous fish species within the analysis area. Downstream affects of sediment routing from harvest and road maintenance activities would have no effect on biological parameters. Riparian areas and large wood recruitment would be protected by stream buffers, and project distance from fish bearing streams reduces the chance of affect to a negligible level.

Cumulative Effects –Fish Biological Parameters

See cumulative effects discussion later in the section.

3.11.6 Cumulative Effects – Fish Habitat Complexity, Water Quality for Fish and Fish Biological Parameters

The complete list of past, present, and foreseeable future projects in the analysis area is located in section 3.1. The cumulative effect for this assessment of fisheries resources focuses on the Straight Creek sub-watershed. Cumulative effects analysis for the project will focus on the Straight Creek sub-watershed (HUC 6, 170900050102) because that is where more than 99% (5,864 acres) of the project will occur. Less than 1% (277 acres) of the project area is located in the Marion Creek sub-watershed (HUC6, 170900050103). Due to the small land area and ridge-top location, there is no probability of effect to fish or water quality in Marion Creek sub-watershed, so effects are not further analyzed in this report for this watershed.

Existing road densities are, approximately 4.2 miles/mile². None of the alternatives would eliminate or create new permanent roads. The action alternatives would cause a short-term increase in the road density by constructing new temporary roads or reopening existing temporary roads. New or reopened temporary roads would occur in the uplands nowhere near fish bearing streams.

Close to 10,156 acres, approximately 59% has been previously managed in the 17,295 acre sub-watershed. Much of the historic timber management utilized regeneration harvest methods. None of the units would result in a net increase in the total acres of disturbance in the

watershed, since only previously managed or fire-disturbed stands would be treated. Final shelterwood overstory removal of shelterwood units would retard the recovery multi-aged stands, but the thinning units would accelerate healthy stand development elsewhere in the project area.

Only the regeneration prescriptions in alternatives 2 and 4 would essentially reset the unit condition to an early seral stage. By planning the majority of the harvest to occur in stands that have previously been disturbed, cumulative effects would be reduced, and the only effect may be to slow the watershed recovery rate. Analysis of changes to peak flows indicates that the alternatives would not result in adverse effects to stream flows or channel conditions. Therefore, no measurable cumulative effect to watershed condition is expected.

There are approximately 6,584 acres of land in the analysis area that are classified as riparian reserves. Of the forested riparian reserves, approximately 54% have been heavily previously managed. However, the stands that would be thinned in the reserves are previously managed stands, so there would be no net increase in riparian reserve disturbance. This project would not result in cumulative negative effects to the riparian reserves.

Several stream enhancement projects are planned to occur in the foreseeable future within the Straight Creek sub-watershed. Large woody material would be added to Lynx Creek and maintained in the North Santiam River. Dispersed site restoration, including soil decompaction and boulder placement, are also slated for future completion. These projects would move stream condition towards the desired future condition for the sub-watershed.

Other past, present, and reasonably foreseeable actions, identified by the interdisciplinary team, would not result in any cumulative effects to fish or habitat.

3.11.7 Conclusion and Rationale

more than half (54%) of the riparian reserves in the Straight creek sub-watershed have been managed. The Willamette NF LRMP and Northwest Forest Plan provide protection measures that are allowing these streams and their associated riparian areas to slowly recover over time towards DFC. Historic, current and future planned stream and riparian enhancement projects are accelerating that recovery.

Implementation of any of the action alternatives would result in some short-term (less than 5 years after project completion) negative effects to stream conditions, primarily through slight increases in the sediment delivery rates to streams, and subsequent increased turbidity levels. Effects are expected to remain localized and not reach the next order stream. Biological parameters and habitat complexity are protected by no harvest buffers on every stream channel in the project area.

The magnitude of effects to fish and habitat indicators is negligible and discountable due to the stable soils, flat topography, and stable hydrologic condition in the analysis area. The probability of effects is further reduced by the distance of fish bearing reaches from harvest and road maintenance activities.

Fish bearing stream reaches containing Management Indicator Species (MIS) resident and anadromous fish occur outside of the project area where the probability of effects to water

quality or habitat is very low. There would be no effect to Management Indicator Species (MIS) or ESA listed fish as a result of implementation of any of the action alternatives.

Table 3-27 Fisheries Comparison of Alternatives

Measurement Criteria for Fish		Alt 1	Alt 2	Alt 3	Alt 4
Probability of measurable negative effects realized to occupied fish habitat	ESA Listed	zero	zero	zero	zero
	MIS Anadromous	zero	zero	zero	zero
	MIS Resident	zero	zero	zero	zero
Magnitude of negative effects to fish habitat	ESA Listed	zero	zero	zero	zero
	MIS Anadromous	zero	zero	zero	zero
	MIS Resident	zero	zero	zero	zero

3.12 Recreation

3.12.1 Regulatory Framework

Regulatory Framework, Desired Condition and Standards and Guidelines

The 1990 Forest Plan sets the regulatory framework as it applies to Recreation and Visual Quality. The following management areas are located within the project area where actions are proposed: General Forest (MA-14a) – Matrix Land and Scenic Partial Retention Foreground (MA-11-d).

3.12.2 Analysis Methods

The analysis methods used to evaluate the effects of the alternatives on recreation and scenery resources were based on a review of the Forest Plan and consistency with applicable Standards and Guidelines. Field visits to the project area, knowledge of recreation use, recreation use data, inventory of existing dispersed sites, past experiences and professional judgment were also used to evaluate the alternatives. Estimates for operation periods including log hauling on roads were obtained from logging specialists. Stand information from silvicultural prescriptions identified

the current condition of the stands within management area 11d. The existing visual condition was evaluated during the Upper North Santiam Watershed Analysis process and was used for this analysis (USDA 1995).

3.12.3 Existing Condition – Recreation

The project analysis area is entirely within the general forest area and is managed for dispersed recreation use. The area along Twin Meadow Road is managed for a “Roaded Natural” experience of the ‘Recreation Opportunity Spectrum’ (ROS) where visitors experience moderate evidence of the sights and sounds of man. Interactions between users may be moderate to high, with evidence of other users prevalent. The general area outside the Twin Meadows Road corridor is managed for a “Roaded-Modified” experience. Sights and sounds of humans are readily evident, and the interaction between users is moderate to high. A substantially modified natural environment characterizes the area (USDA FEIS 1990).

No developed recreation sites are located within the project area. Camp Pioneer Boy Scout Camp and Mt. Jefferson Wilderness area with one trailhead are adjacent to the project area. Season of use is primarily June through the end of October when the area is free of snow. Camp Pioneer Boy Scout camp is in session the last weekend of June through the second weekend in August. Approximately 150 scouts attend Camp Pioneer each week, exiting on Saturdays and a new group checking in each Sunday. Primary dispersed use activities include camping, hunting, huckleberry and mushroom picking, sightseeing, and nature study. There are occasions of incidental recreation activities such as mountain biking, ATV use and non-motorized winter sports.

Road 2261 provides road access to the Pine Ridge Trailhead to the Mt. Jefferson Wilderness. When not affected by wildfire closures, Pine Ridge Trail (#3443) typically receives about 1000 visitors each year (USDA 2002-2006). The majority of these users are boy scouts during end of June through first week of August that access the Turpentine Basin, Eight Lakes Basin and Marion Lake. Others using the trailhead are hunters in the fall. Just over 2 miles of the Turpentine Trail (#3490) parallels the project area. The turpentine trail is a relatively low use trail when compared to other trails in the Mt. Jefferson Wilderness. Some horse users ride the Turpentine Trail as part of a loop route from Big Meadows Horse Camp area. The horse camp receives less than 500 visitors a year (USDA 2006). Most of the winter recreation use is to the south of the project area in the Big Meadows/Maxwell Butte Snopark area. The Twin Meadows road may have an occasional vehicle or two parked at the highway on weekends to access the area for winter sports.

Dispersed camping is commonly found on existing landings and old road spurs that typically can be reached by a vehicle. Twenty-five dispersed sites are within or adjacent the project area units and were located during a field review. About 4 sites are used frequently on most weekends, and another 7 sites may be used occasionally 1-6 times a year, mostly during hunting season. The remainder 14 sites appear to be used once a year or only had one time use, likely when the other more attractive sites were used during hunting season.

3.12.4 Direct and Indirect Effects – Recreation

Direct and Indirect Effects – Alternative 1 – Recreation

The existing condition would be maintained. There would be no truck traffic, noise disturbance from operations and Roads 2257 and 2261 would not be improved.

Direct and Indirect Effects – Alternative 2 – Recreation

Alternative 2 would involve harvesting within 1668 acres of a 2.5 mile by 4 mile area. The activities, in total, would take about 222 operation days of harvesting trees and 188 days of road hauling. Operation and road hauling may not be additive as activities as both activities could take place at the same time. It is anticipated that harvest operations would occur over a three year period sometime between June 15 and December 1st but days of actual activity would vary each season. In addition, some of the actions may overlap in timing so the potential disturbance could be less than the sum of all the operation or hauling days. It is not anticipated that there would be any winter logging and snow plowing of roads. However, if winter operations do occur, impacts to visitors would be minor since the area receives incidental use and is not a formal Snopark. Visitors would select a comparable alternative area nearby to recreate. Table 3-28 shows the relationship among alternatives for harvest days, hauling days, years of harvest, and potential disturbance of dispersed sites.

Table 3-28 Effects to Recreation Resources by Alternative

Alt	Operation Days	Hauling Days	Est. Yrs. to Harvest	Dispersed Sites at Landings Affected by Noise	Other Dispersed Sites Affected by Noise
1	0	0	0	0	0
2	222	188	3	8	25
3	149	94	2	3	25
4	92	94	2	3	25

As part of alternative 2, the upper gravel section of the Twin Meadows Road, about 1.5 miles, would be paved and would improve the condition and safety of this road. Paving would take about 2 weeks to complete. The road would be closed during this timeframe, potentially displacing visitors to other adjacent areas. If construction occurs anytime between mid-June through the 3rd weekend of August, road reconstruction would be coordinated with Camp Pioneer operations so that access is maintained. If construction occurs during hunting season, it would displace hunters to other areas. Other improvements along Roads 2257 and 2261 would

include patching asphalt, striping, brushing, spot rock and danger tree removal, which would improve the condition and safety of these roads used by the public. Depending on when these road reconstruction projects are done, it would cause traffic delays or detours within the project area during the summer and fall recreation season. Delays would be relatively short term inconveniencing visitors by a few minutes up to a several days. Road improvements are not anticipated to increase visitor use within the Mt. Jefferson Wilderness since the trailhead primarily serves the Boy Scouts at Camp Pioneer. Marion Lake and Duffy Lake Trailheads are the preferred trails into the Marion Lake and Eight Lakes Basin.

Based on past encounters, hunters have expressed concern about operations that create noise disturbance which may affect their hunt. The proposed activities would likely occur during the late summer through fall and may have an impact to hunters in and around the units. Operation and log hauling restrictions during the opening weekends of the High Cascades Buck Rifle, Western Oregon Buck and Elk season would help reduce this impact during this critical time. Harvest operations on 1668 acres are distributed over the landscape throughout a 2.5 x 4 mile area, and over the course of three years. Production rate is estimated at about 7.5 acres per day so the duration of noise disturbance for any one harvest unit is relatively short term or up to a few weeks. Hunters would be displaced to other areas adjacent the project area.

The Boy Scout Camp would primarily be affected by chainsaw and skyline yarding noise adjacent Camp Pioneer (Units 6, 8, 18, 46, 47, 49 and 80) only when the camp is in operation and harvest activities are occurring simultaneously. Under this alternative, harvest activities within these units is expected to last up to 20 days over the course of the three logging seasons (years) but may not necessarily occur when the scout camp is in session. The noise would be audible when outdoors but is not expected to be disruptive.

Harvest activities within one mile of Wilderness trails are expected to last up to 84 over the course of three logging seasons. Chainsaw or skyline operation noise may be audible along portions of 2 miles of the Turpentine Trail, and could affect visitors' solitude or wilderness experience. However, operations would not occur within the entire 2 mile length or within all the units at one time. Use of the Turpentine Trail is minor compared to the Pine Ridge Trail. Pine Ridge trail receives about 1000 visitors per year, mostly by Boy Scouts from Camp Pioneer. The trail leads away from the project area and into the Turpentine Basin, Eight Lakes Basin and Marion Lake areas. As visitors travel east to the interior of the wilderness, noise from the activities would not be heard and is not anticipated to affect solitude.

Table 3-29 Potentially Audible Disturbances to Wilderness and Camp Pioneer

Alt	Duration of Harvest w/in 1 Mile of Wilderness Trails (days)	Duration of Harvest Potentially Audible from Camp Pioneer (days)	Duration of Harvest Potentially Audible from Camp Pioneer (logging seasons)
1	0	0	0
2	84	20	3
3	67	15	2
4	31	8	2

Log hauling traffic can conflict with recreational traffic during the peak use season (summer and fall) and exposure increases during this time. Recreational traffic on weekends is higher than weekday traffic during any season. Dust, noise and exhaust associated with logging operations would increase in the immediate sale area and along haul routes. Hauling would be restricted on weekends when Camp Pioneer participants are either traveling to the camp or returning home. If purchaser does haul on Road 2261 on these designated weekends, the road would be signed and flaggers would be stationed at road endpoints and have radio communication to truck drivers for public safety. Truck traffic signing would be posted to warn travelers of trucks on the roads. About 20 trucks per day are estimated to haul off Roads 2261 and 2257. Log hauling traffic on any given day is somewhat limited and is restricted on weekends during Camp Pioneer operating season and opening weekends of three key hunting seasons. Hauling isn't expected to have a substantial impact to visitors.

Visitors could potentially be directly affected when dispersed sites are used as landings (8 sites) or when they are adjacent harvest activities (up to 25 dispersed sites). Sites used as landings may displace campers to other nearby campsites for up to three seasons until landings are cleared of debris. In addition, campers may temporarily be displaced from adjacent dispersed sites (not used as landings) during harvest operations because of safety or noise. There are more dispersed sites available within and adjacent the project area than needed at any one time so effects are not expected to be significant. Production rate is estimated at about 7.5 acres per day so the duration of dispersed sites not available for use within the vicinity of the harvest operation is expected to be relatively short term. Essentially, this may displace campers from any given adjacent dispersed site for up to a few weeks. However, the likelihood of the timing/location of harvest activities within or adjacent dispersed sites and potential occupancy of these sites at the same time is relatively low since use of 85% of the sites is relatively infrequent (>1-6 times a year). Landings not currently being used as dispersed sites may also likely attract dispersed camping activities in the future.

Alternative 2 proposes to construct 0.6 miles of temporary roads or reopen 3.5 miles of existing roads. These roads would be closed to the public once operations are complete, so there is no affect to the public since there was no previously established use.

The alternative 2 is not anticipated to have any adverse effect to recreation or Camp Pioneer participants. Road reconstruction would improve safety of roads used by visitors and is offset by short periods of traffic delays, road closure or detours.

Direct and Indirect Effects –Recreation – Alternative 3

Alternative 3 would involve harvesting 779 acres. The activities in total would take about 149 operation days of harvesting trees and 94 days of road hauling. It is anticipated that harvest operations would occur over a two year period sometime between June 15 and December 1st but days of actual activity would vary each season. In addition, some of the actions may overlap in timing so the potential disturbance could be less than the sum of all the operation or hauling days. Alternative 3 would have similar impacts to recreation as described in alternative 2. The difference is that the duration of harvest activities that result in noise disturbance and truck traffic on roads would occur over a 2 year period rather than 3 years since less volume is being removed. Three dispersed sites would be directly affected by being used as landings as opposed to 8 sites in alternative 2. Alternative 3 affects the same 25 dispersed sites that are adjacent the project activities. Some visitor displacement may occur at these affected sites if harvest activities are occurring in or adjacent these sites.

Under this alternative, harvest activities adjacent Camp Pioneer is expected to last up to 15 days over the course of the two logging seasons (years) but may not necessarily occur when the scout camp is in session. The noise would be noticeable when outdoors but is not expected to be disruptive.

Chainsaw or skyline operation noise may be audible along portions of the Turpentine Trail and Pine Ridge Trail, and could affect a visitor's solitude or wilderness experience. Harvest activities within one mile of Wilderness trails are expected to last up to 67 days over the course of two logging seasons.

Alternative 3 proposes to construct 0.2 miles of temporary roads or reopen 0.5 miles of existing roads. These roads would be closed to the public once operations are complete, so there is no affect to the public since there was no previously established use.

Alternative 3 is not anticipated to have any adverse effect to recreation or Camp Pioneer participants. Road reconstruction would improve safety of roads used by visitors and is offset by short periods of traffic delays, road closure or detours.

Direct and Indirect Effects –Recreation – Alternative 4

Alternative 4 would involve harvesting 889 acres within a 2.5 mile by 4 mile area. The activities in total would take about 92 operation days of harvesting trees and 94 days of road hauling. It is anticipated that harvest operations would occur over a two year period sometime between June 15 and December 1st but days of actual activity would vary each season. In addition, some of the actions may overlap in timing so the potential disturbance could be less than the sum of all the operation or hauling days. Alternative 3 would have similar impacts to recreation as described in alternative 2. The difference is that the duration of harvest activities that result in noise

disturbance and truck traffic on roads would occur over a 2 year period rather than 3 years. Shelterwood overstory removal has a faster rate of production so only involves about 92 days of operation in contrast to 222 days in alternative 2 or 149 days in alternative 3. Three dispersed sites would be directly affected by being used as landings as opposed to 8 sites in alternative 2. Alternative 4 affects the same 25 dispersed sites that are adjacent the project activities. Some visitor displacement may occur at these affected sites if harvest activities are occurring in or adjacent these sites.

Under this alternative, harvest activities adjacent Camp Pioneer is expected to last up to 8 days over the course of the two logging seasons (years) but may not necessarily occur when the scout camp is in session. The noise would be noticeable when outdoors but is not expected to be disruptive.

Chainsaw or skyline operation noise may be audible along portions of the Turpentine Trail and Pine Ridge Trail, and could affect a visitor's solitude or wilderness experience. Harvest activities within one mile of Wilderness trails are expected to last up to 31 days over the course of two logging seasons. Alternative 4 proposes to construct 0.4 miles of temporary roads or reopen 3 miles of existing roads. These roads would be closed to the public once operations are complete, so there is no affect to the public since there was no previously established use.

Alternative 4 is not anticipated to have any adverse effects to recreation or Camp Pioneer participants. Some recreation displacement may occur to other alternative areas. Road reconstruction would improve safety of roads used by visitors and is offset by short periods of traffic delays, road closure or detours.

3.12.5 Cumulative Effects – Recreation

Other foreseeable projects include precommercial thinning, potential salvage of wind-thrown or fire damage trees and aerial fertilization in the sub-watershed over the next 10 years. All action alternatives may overlap in time and space with future projects, subsequently increasing noise in the area as a result of chainsaw use, skidding/decking logs or helicopter use. It would also result in additional commercial traffic on Twin Meadows Road 2261 and Rd 2257: 188 additional days for Alternative 2, and 94 additional days for alternatives 3 and 4. These sales would be operated under restrictions similar to Presley's Twin to minimize noise disturbance to visitors. Rehabilitation of landings along the 2257 and 2261 roads as part of proposed post sale resource enhancement projects could have a positive effect on the visual landscape in this area.

3.12.6 Conclusion – Recreation

The differences between the effects of alternative 2, 3 and 4 is the duration and spatial context of harvest activities that results in potential noise disturbance, truck traffic on roads or displacement from existing dispersed sites (see alternative comparison table 2-8). Alternative 2 has the most operating days (222 days) resulting in more days of potential impacts. Alternative 3 would have a moderate amount (149 days) and alternative 4 has the least in terms of operating days (92

days). All alternatives could potentially affect up to 25 dispersed sites that are adjacent/within proposed units. However, the likelihood of the timing/location of harvest activities within or adjacent dispersed sites and potential occupancy of these sites at the same time is relatively low since use of 85% of the sites is relatively infrequent (>1-6 times a year).

Some visitor displacement may occur but there are many suitable alternatives within and adjacent the project area for their activities. Noise adjacent Camp Pioneer would be audible when outdoors but is not expected to be disruptive. Noise could also potentially affect visitor's solitude along portions of the Turpentine or Pine Ridge Trails. Opening hunting weekend restrictions on operations and weekend road hauling mitigations on Road 2261 when Camp Pioneer is in session should help minimize many of the potential impacts. In summary, the action alternatives are not expected to have an adverse impact to recreation. Road reconstruction would improve safety of roads used by visitors and is offset by short periods of traffic delays, road closure or detours. There would be some inconveniences due to road reconstruction activities or visitor displacement from harvest operations to other areas to pursue recreational activities in the short term varying from a few days to a few weeks.

3.13 Scenic Quality

3.13.1 Existing Condition – Scenic Quality

The project includes portions along the Twin Meadow Road that fall within Management Allocation 11d - Scenic Partial Retention Foreground. The ROS for this setting is characterized by resource modification and utilization practices that are evident, but harmonize with the natural environment. Within the watershed, the area within MA-11d is comprised of 4091 acres (Upper North Santiam Watershed Analysis, 1997). The percentage of this area in early seral stage is 24%, mid-seral is 24% and late seral is 52%. About 34% of the area is in a large tree diameter class. Maximum area in disturbed condition should not exceed 14% of the acres available and suited for timber harvest in this management area. A harvest unit is considered disturbed until the regenerated stand is 10-15 feet in height. Existing disturbed condition in 1997 was 12%. It is anticipated that more than 12% of stands are considered recovered, since the average understory tree heights have grown over 10-15 feet tall when this analysis was done 10 years ago. Existing shelterwood and regeneration harvest units along Road 2261 were planned prior to the current Forest Plan Standard and Guidelines and exceeded opening sizes for this management area. These stands are now considered recovered due to average tree heights over 10-15 feet tall.

3.13.2 Direct and Indirect Effects – Scenic Quality

Direct and Indirect Effects –Scenic Quality – Alternative 1

The existing condition would be maintained. As mature stands continue to age, stand health would decline and fuel loadings would increase. The visual quality of the area could be jeopardized in the event of a large scale fire.

Direct and Indirect Effects –Scenic Quality – Alternative 2

Under alternative 2, about 133 acres falls within MA-11d. These include portions of units 14, 15, 161 and 17, and all of unit 18 and were previously shelterwood regeneration harvest units. These units were planned prior to the current Forest Plan Standard and Guidelines and exceeded opening sizes for this management area up until recently. These stands are now considered recovered since the average understory tree height is over 10 feet. All units except for Unit 14 have more than 10 trees per acre (TPA) as required by Standards and Guidelines to be left for diversity and another 5 to 6 for snag and downed woody debris recruitment. No trees within MA-11d would be removed from Unit 14 since there are only 7 trees per acre currently. Eight TPA, or over 1/3 of the overstory, would be removed from Unit 15. Units 14 and 15 are buffered by mature stands adjacent Road 2261 so the view into these stands from this road is mostly obscured. Unit 18 and the southern end of unit 161 are directly visible from Road 2261. Less than half of the standing over story or 5 trees per acre would be removed from unit 18, retaining 10 TPA for diversity plus 5-6 TPA for wildlife snags and downed woody debris. About 12 trees per acre or about ¼ of the overstory in Unit 161 within the visual allocation would be removed, leaving 5-6 TPA for diversity wildlife snags and downed woody debris. Table 3-30 shows this relationship between wildlife snags and downed woody debris and the required 10 TPA for diversity.

Removing a percentage of the vertical structure would change the character of these stands but overall the units have the appearance of being very open with sparse remnant overstory trees and a healthy young stand of trees growing underneath. Removal of overstory trees would not result in a newly created opening or net gain in acres in “disturbed condition” since the opening was originally created when the shelterwood harvest was implemented. These stands are now regenerated and fully stocked with trees over 10 feet tall.

Table 3-30 Shelterwood Overstory Removal in Management Area 11d

Unit	Acres	Acres in MA-11d	Avg. TPA	Live Trees for Snags	Live Trees for DWD	Retain for MA-11d	Total Un-harvested Trees	TPA Removed in MA-11d
14	52	17	7	3	2	10	15	0
15	27	13	24	3	3	10	16	8
161	16	3.5	27	3	2	10	15	12
18	18.5	18.5	21	3	3	10	16	5

Only 81 acres of the total proposed thinning activity actually falls within Management Area 11d. For the first 20 years after harvest, thinning could improve forest health (reduce hazards and mortality) and subsequently enhance the scenic quality of the project area. Thinning would retain a canopy closure of 50 to 70 percent to meet other resource objectives and would not create openings. Stands would look naturally appearing with varying texture (densities) but no edges. Skyline units would have corridors that may be evident but are consistent under the matrix management allocation. Skyline corridors would not be evident along Road 2261 within MA-11d. Portions of stands with low density or small openings would retain existing canopies.

One small 3 acre regeneration harvest would create an opening within general forest matrix land and is consistent with the Forest Plan for Visual Quality Objectives.

During and immediately following harvest operations, the impact to visual quality would be short term (generally between 1-5 years). Short term affects would include slash and slash piles present near and along roads until fuel treatment to reduce these are complete and landings are revegetated. With mitigation measures, no adverse impacts to scenic resources are expected as a result of implementation of the project.

Fuel treatment projects are targeted at reducing potential wildfire intensity by reducing ladder fuels and fuel loadings that can cause large crown fires. Minimizing risk of canopy fires and keeping fires to the ground protects stands and old-growth trees from being burned by slowing down the fire and reducing acres from being burned. If left untreated, the risk of stand replacement fires increases. Intense stand replacement fires can diminish the scenic quality of an area over several decades with dead, blackened stands until a new forest and ground cover is restored. The project is expected to have a benefit on maintaining a healthy forest that would be more resistant and defensible against wildfire.

Direct and Indirect Effects –Scenic Quality – Alternative 3

Alternative 3 would have a similar affect to scenic quality as described in alternative 2 in terms of thinning and slash/fuel treatments. The difference between this alternative and alternative 2 is

that there would be no overstory tree removal within existing shelterwood units, leaving the residual large trees in tact.

Direct and Indirect Effects – Scenic Quality – Alternative 4

Alternative 4 would have a similar affect to scenic quality as described in alternative 2 in terms of shelterwood removal. The difference between this alternative and alternative 2 is that there would not be any thinning or fuel treatments to reduce fuel loading creating a higher risk for crown fires as the stands continue to age. If crown fires were to occur in this area, there could be catastrophic consequences and subsequently diminish the scenic quality of the area.

3.13.3 Cumulative Effects – Scenic Quality

Other foreseeable projects include precommercial thinning, potential salvage of wind-thrown or fire damage trees and aerial fertilization in the sub-watershed over the next 10 years. Combined with thinning alternatives 2 and 3, reasonably foreseeable actions are expected to be beneficial for the long-term integrity of the scenic resources across the landscape by improving stand health.

3.13.4 Conclusion – Scenic Quality

All action alternatives with design measures meet Visual Quality Objectives as prescribed in the Forest Plan. The difference among alternatives is that alternatives 2 and 3 have thinning and fuel reduction treatments and alternative 4 does not. Thinning is expected to improve stand health which could subsequently enhance scenic quality for several decades. Fuel reduction treatments would also reduce some of the hazards and associated risk of crown fires. Reducing hazards would decrease potential risk of stand replacing fires which indirectly benefits maintaining the visual quality of the area.

Alternatives 2 and 4 propose shelterwood overstory removal of existing shelterwood units. Units 161 and 18 are most visible from Road 2261. About half of the remnant overstory trees within these existing openings would be removed; however, no new created openings would be generated. All shelterwood overstory removal stands are now considered recovered due to average tree heights of the understory over 10 feet tall.

3.14 Road Engineering _____

3.14.1 Introduction

The proposed development for the Presley's Twin Project area would utilize but not expand the existing Forest Development Road (F.D.R.) system. Work would be required on the existing F.D.R. system either as reconstruction (including paving), pre-haul maintenance, during-haul maintenance or post-haul maintenance. Additionally, a small amount of construction and

opening of existing temporary roads would be required. The objective for the existing F.D.R. system would be to maintain it to the level necessary to facilitate haul during the recommended season of use and comply with the current Road Management Objectives.

Documentation of the decision process and further notes are on file at the Detroit Ranger District in the Presley's Twin Analysis File.

There are two specific F.D.R. related concerns with the project area; one health and safety, and the other archeological. The health and safety concern is directly related to danger tree identification and removal. The remedy for this is to have someone certified in danger trees identify and assess the trees along haul routes. Then have the trees treated according to the Forest Service Pacific Northwest Region (Region 6) policy (FSM 7733, R6/PNW Supplement Number 7730-2005-1, December 12, 2005) during the initial phases of reconstruction or pre-haul maintenance. The archeological concern deals with the historical significance of Road 2257. The remedy for this concern would be to match the aggregate gradation to the existing material on the road while reconstructing this route to preserve the historical appearance.

A total of 37.54 miles of F.D.R. would be used for project activities. Seventeen Forest Development Roads, involving 28.76 miles of system roads, would be reconstructed at a total estimated cost of \$836,955. This large figure includes monies allocated for paving the last stretch of the 2261 road to the Camp Pioneer Boy Scout camp. While not directly identified, it is anticipated that all roads would receive some level of maintenance. Haul activities outside of the normal operating season would require additional work to preserve the desired maintenance objectives.

Temporary road work includes 4.1 miles of which 0.6 miles would be new construction (Appendix C, Table 3), for a total cost of \$ 20,500.

3.14.2 Regulatory Framework

- Forest-Wide Standards and Guidelines FW-094 to 102 and FW-308 to 319.
- 36 CFR Parts 212, 251, 261, and 295 Travel Management; Designated Routes and Areas for Motor Vehicle Use
- FSM sections 1561.9a, 7700, 7710, 7730, 7733, 7709.55, 7709.58 and 7709.59

3.14.3 Analysis Methods

Primary information sources used to describe the existing condition and to analyze alternative differences include INFRA Travel Routes, Roads GIS Layer, VEGIS GIS Layer, Stream GIS Layer, and the Detroit Ranger District Roads Map.

3.14.4 Desired Future Condition

The following table depicts forest roads within the project area that are designated as key forest roads according to the Willamette National Forest Roads Analysis (January 2003). Roads listed

should be maintained to serve the public, permit holders, and employees as access to the National Forest while reducing impacts to the environment.

Table 3-31 Key Forest Roads

Road Number	Objective Maintenance Level
2257 000	2 – High clearance vehicles
2261 000 MP 0.00 to MP 3.79	3 – Suitable for Passenger cars
2261 000 MP 3.79 to MP 5.26	2 – High clearance vehicles
2261 405	2 – High clearance vehicles

These key forest roads “should be operated and maintained to standards consistent with its road maintenance objective. The public would be encouraged to use the system of Key Forest Roads for access into and through the forest” (Willamette National Forest Roads Analysis, 2003).

Key Forest Roads are perceived to be the minimum system of routes needed to meet anticipated forest management objectives and public access needs. Key Forest Roads are the roads most traveled to sites within the forest. They would provide the majority of forest visitor, administrative, commercial and research travel needs. These roads provide a network of vital inter-forest connections to important destinations.

3.14.5 Existing Condition

All of the roads within the Presley's Twin project area are owned and maintained by the U.S. Forest Service. These roads are in generally good condition due to light traffic volumes and seasonal access. Needed road work normally involves only brushing, blading, ditch reconditioning, spot surfacing placement, danger and downed tree removal, culvert inlet and outlet cleaning, and occasional culvert replacements.

Primary access to the Presley's Twin project area is provided by Roads 2261 and 2257. Road 2261 is paved to mile point 3.79, and then gravel surfaced to the end. Road 2257 begins as an improved native-surfaced (shot rock) road at the northern most intersection with Highway 22, and continues as such throughout the Presley's Twin project area. All other roads tributary to these major access roads are single lane gravel, pit-run, or native-surfaced roads with turnouts which have been built and maintained primarily for timber harvest activities. Most of these roads are termed local roads, and 3.42 miles have been closed by some method for wildlife issues.

3.14.6 Direct and Indirect Effects

Direct and Indirect Effects – Engineering – Alternative 1

Road conditions would remain the same. Road maintenance activities would occur according to established patterns of routine maintenance. No additional road maintenance, reconstruction, or construction would occur with this alternative.

Direct and Indirect Effects – Engineering – Alternative 2

For this alternative 3.5 miles of existing temporary roads would be reopened and 0.06 miles of temporary roads would be constructed. The existing F.D.R. system would require on system roads miles of reconstruction, while 7.83 miles would require pre-haul maintenance. All roads would receive monies to accomplish brushing, ditch reconditioning, slough removal, slump repair, culvert cleanout and replacement, surfacing, filling in of water dips and danger tree removal.

Direct and Indirect Effects – Engineering – Alternative 3

Alternative 3 would consist of 0.5 miles of existing temporary road to be used in addition to constructing 0.2 miles of temporary roads. The existing F.D.R. system need 19.84 miles reconstructed and 6.51 miles of road would need pre-haul maintenance. All roads would receive monies to accomplish brushing, ditch reconditioning, slough removal, slump repair, culvert cleanout and replacement, surfacing, filling in of water dips and danger tree removal.

Direct and Indirect Effects – Engineering – Alternative 4

Alternative 4 would need 3.0 miles of existing temporary roads opened up and would require the construction of 0.4 miles of new temporary roads to be constructed. The existing National System Forest Roads (NSFR) need 28.76 miles reconstructed and 7.83 miles of roads would need pre-haul maintenance. All roads would receive monies to accomplish brushing, ditch reconditioning, slough removal, slump repair, culvert cleanout and replacement, surfacing, filling in of water dips and danger tree removal.

3.14.7 Cumulative Effects

There would be no foreseeable cumulative effects arising from past, present or reasonably foreseeable future actions as a result of any alternatives proposed as part of the roads analysis in the Presley's Twin Sale.

3.15 Economic Analysis

3.15.1 Introduction

This section deals with three aspects of economic and social impacts: economic viability, impacts to the local economy/employment, and environmental justice. Economic viability is dependent on costs and revenues associated with a particular timber sale. Impacts to the local economy are a reflection of District and Forest harvest levels and employment. Timber sales, fuel treatments, and associated resource work can generate employment and stimulate the local economy. Environmental justice can also be a concern if minorities are not granted equal opportunities to benefit from government programs and projects.

3.15.2 Regulatory Framework

- Executive Order 12898 (February 11, 1994) on Environmental Justice

3.15.3 Analysis Methods

A comparison of the alternatives was completed for the Presley's Twin Project area on the Detroit Ranger District. The Transaction Evidence Appraisal (TEA) method with the most recent product log values and TEA appraisal costs were used for evaluation.

The harvest volumes and species mix are estimates from preliminary samples taken in the project area during field reconnaissance, and from the silvicultural prescriptions. Timber values were calculated using the current Product Quality Adjustment (PQA) for delivered logs, in western Oregon saw mills. Log Cost version 7.0 was used to develop the stump to truck logging costs for each alternative, and Haul Cost version 5.2 was used to calculate log transport costs. In addition, a brush disposal appraisal was developed for each alternative based on the Fire and Fuels Report (Curtis, 2007). Road maintenance cost estimates were developed for each alternative, and road reconstruction costs were used from the Blowout Thin Roads and Access Report (Latham, 2007) cost estimates.

3.15.4 Economic Viability

Existing Condition – Economic Viability

Logging costs and road related costs are often the costs that have the most direct effect on economic viability. Market conditions may fluctuate throughout the year, and depending on the time of year this sale is offered for auction, the current estimates may or may not be accurate, which could have an impact on the final sale values. Also, rising energy and fuel costs could create a substantial increase in sale operation and manufacturing costs.

Direct and Indirect Effects – Economic Viability – Alternative 1

This alternative would not harvest any timber and therefore would not support direct, indirect and induced employment, or increased income to local economies. Current downward trends in timber harvesting from National Forests lands would continue into the future. Current employment in the wood products sector of the local economy would remain unchanged.

Direct and Indirect Effects – Economic Viability – Alternative 2

Alternative 2 was found to be economically viable with a net appraised value of \$4,879,418. Alternative 2 has a higher appraised value than alternatives 3 and 4 because it has the most volume, value and area treated with the most efficient logging methods.

Direct and Indirect Effects – Economic Viability – Alternative 3

Alternative 3 was found to be economically viable and has the next highest appraised value at \$2,589,990, primarily due to having a smaller average log diameter with less value, and the least road reconstruction costs.

Direct and Indirect Effects – Economic Viability – Alternative 4

Alternative 4 was found to be economically viable but would have the lowest appraised value at \$2,476,998, because it has slightly less total estimated volume. However, the alternative has the highest log value and also a road reconstruction cost nearly equal to alternative 2.

The appraisal costs for each alternative are summarized in the following chart. See Appendix D for the complete Economic Analysis.

Table 3-32 Estimated Present Net Value of Action Alternatives

Item	Alt 2	Alt 3	Alt 4
Gross Value (dollars in thousands)	10,182	4,909	5,335
Associated Costs (dollars in thousands)	4,765	2,716	3,059
Appraisal Competition Adjustment (dollars in thousands)	610,545	287,802	275,293
Net Appraised Value (dollars in thousands) (gross value – assoc. costs – approx. comp. adjustment)	4,879	2,589	2,477
Cost/Benefit Ratio (gross value/ associated costs)	1.89	1.63	1.60

3.15.5 Local Economy and Employment

Existing Condition – Local Economy and Employment

The economy of the local communities from the Salem urban-growth boundary to Detroit depends on a mixture of tourism, recreation, timber industry, and Forest Service jobs for

stability. Local businesses that rely on tourism and recreation include the marinas on Detroit Reservoir, and the lodges, restaurants, stores, gas stations, along the North Santiam River and Highway 22 corridors. Timber industry jobs include a variety of woods and mill jobs, with sawmills in Mill City and Lyons. Forest Service jobs in the vicinity are located at Detroit, Sweet Home, and Sisters Ranger Stations. Tourism and recreational activities connected with National Forest lands have been on the increase in recent years for the Detroit Reservoir and North Santiam River areas. Employment in tourism and recreation-related services has also increased accordingly.

Historically, government employment and expenditures have provided a degree of stability in rural communities such as Detroit, Mill City, Idanha, Gates, Lyons, and Mehama. With reduced Forest Service budgets and work force, and a switch to management emphasis that produces generally lower amounts and value of products, federal workforce and program expenditures has not buffered economic downturns as in the past (Oregon Department of Employment, 2001).

The current level of timber harvesting on the Willamette National Forest has dropped substantially from the levels of the late-1980s. This decrease has contributed to a drastic decline in the number of local jobs associated with wood products industry in the area.

The primary effect on timber harvest-related employment would occur from commercial harvesting associated with the alternatives over the next two years. In addition to primary harvesting jobs, there is employment associated with post-sale service contracts. Levels of harvest volume by alternative would affect employment and income in several ways:

- Directly - effects attributable to employment associated with harvesting, logging, and mills and processing plants for saw timber, pulp, chips, veneer, and plywood;

- Indirectly - effects attributable to industries that supply materials, equipment, and services to these businesses; and

- Induced - effects attributable to personal spending by the business owners, employees, and related industries.

Direct and Indirect Effects – Local Economy and Employment – Alternative 1

This alternative would not harvest any timber and therefore would not support direct, indirect, and induced employment, or increased income to local economies.

Direct and Indirect Effects – Local Economy and Employment – Alternative 2

Jobs created in the logging sector in Oregon are estimated at 3.5 jobs per million board feet (MMBF) harvested (Gebert et. al., 2002). Jobs created in the timber products manufacturing sector in Oregon (using the estimate for sawmill jobs) are estimated at 4.0 jobs per million board feet, (Gebert et. al., 2002). Using these estimates, alternative 2 would provide about 65 jobs in the logging sector and about 75 jobs in forest products manufacturing. Alternatives 3 and 4

would each provide about 33 jobs in the logging sector and about 37 jobs in forest products manufacturing.

Direct and Indirect Effects – Local Economy and Employment – Alternative 3

Jobs created in the logging sector in Oregon are estimated at 3.5 jobs per million board feet (MMBF) harvested (Gebert et. al., 2002). Jobs created in the timber products manufacturing sector in Oregon (using the estimate for sawmill jobs) are estimated at 4.0 jobs per million board feet, (Gebert et. al., 2002). Using these estimates, alternative 3 would provide about 33 jobs in the logging sector and about 37 jobs in forest products manufacturing.

Direct and Indirect Effects – Local Economy and Employment – Alternative 4

Jobs created in the logging sector in Oregon are estimated at 3.5 jobs per million board feet (MMBF) harvested (Gebert et. al., 2002). Jobs created in the timber products manufacturing sector in Oregon (using the estimate for sawmill jobs) are estimated at 4.0 jobs per million board feet, (Gebert et. al., 2002). Using these estimates, alternative 4 would provide about 33 jobs in the logging sector and about 37 jobs in forest products manufacturing.

Cumulative Effects – All Alternatives– Economic Viability

Other employment would continue to occur as a result of other timber sales in progress, recreation activities, and other special use receipts across the Forest. Commercial collection of non-timber forest products, such as mushrooms, could continue to occur, although the quantity of harvest is unknown. Overall, none of the alternatives would result in economic-related cumulative effects.

3.15.6 Environmental Justice

Data regarding minorities or people with disabilities employed in the region in the timber, mining, road construction, forestry services, and recreation sectors is unavailable. Some firms contracted by the Forest Service for reforestation work have traditionally hired Hispanic workers that comprise a migratory workforce in the area. Asian and Pacific Islanders uses of the area include commercial mushroom harvesting and developed camping associated with this activity. Some contracts are reserved for award to minority businesses under the USDA Office of Small and Disadvantaged Business Utilization and the Small Business Administration.

Direct and Indirect Effects – Environmental Justice – Alternative 1

All current uses of the National Forest System lands would continue, including recreation, harvesting of non-timber forest products, special-use permits, subsistence uses, and spiritual/aesthetic uses. Effects to minority populations, disabled persons, and low-income groups would not be disproportionate with other users of the National Forest System lands.

Direct and Indirect Effects – Environmental Justice – Alternative 2

These alternatives provide a variety of opportunities for potential contracts. Alternative 2 would have no impact on the contracting process or the USDA Small Business Administration program for reserving contracts for minority groups for tree planting, precommercial thinning, and road restoration. Employment and income would be available to all groups of people, subject to existing laws and regulations for set-asides, contract size, competition factors, skills and equipment, etc.

Set-asides for Small Business Administration Contracting opportunities would not be affected. Employment by firms that have hired Hispanic workers or other minority groups or low-income workers associated with reforestation or other potential contracting needs would not differ from those employed in the sectors as a whole. In the short-term (3-5 years), reforestation needs would potentially benefit this group. This alternative would plant about 85 acres.

There is no existing information on how much use the area receives from minority and low-income populations. Opportunities for all groups of people to collect species from disturbed and non-disturbed sites would be maintained by all alternatives, and no disproportionate effect is anticipated to subsets of the general population. None of the alternatives would have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes.

Direct and Indirect Effects – Environmental Justice – Alternative 3

Effects on Environmental Justice as a result of this project would be similar to those described in alternative 2 except this alternative would plant about 20 acres.

Direct and Indirect Effects – Environmental Justice – Alternative 4

Effects on Environmental Justice as a result of this project would be similar to those described in alternative 2. This alternative would plant 85 acres.

Cumulative Effects – All Alternatives – Environmental Justice

There are no environmental justice-related cumulative effects related to any of the alternatives.

3.15.7 Conclusion and Rationale

Projected costs are as realistic as possible, using the most current information available, and with no bias introduced to influence the results. The above costs and revenues could be affected by the following factors; fluctuating log markets, increased fuel costs, increased inflation, changed conditions of roads after preliminary field reviews, changes in unit boundaries for needed resource protection, and other factors that may become necessary as work progresses on the sale. However, most of the changes that may occur during field work would have relatively little effect on sale values, except when volume is deleted.

3.16 Heritage Resources

3.16.1 Regulatory Framework

The legal framework that mandates the Forest Service to consider the effects of its actions of heritage resources is wide-ranging. In this case, Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation governing the treatment of cultural resources during project planning and implementation.

- 36 CFR 800 (Protection of Historic Properties),
- 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places),
- 36 CFR 296 (Protection of Archaeological Resources),
- 1994 Programmatic Agreement (PA) (amended in 2004) among the USDA Forest Service PNW, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service.

3.16.2 Analysis Methods

The heritage resource inventory design was based on information gleaned from the district heritage resource files (inventory reports, site reports, historic maps, GLO maps and ethnographic information), topographic maps, and Geographic Information Systems (GIS).

Ground surveys for the proposed Presley's Twin sale occurred during 2004 and 2006. Surveys were conducted following parallel, compass-oriented transects spaced from 15 to 20 meters apart, in accordance with current survey standards. When possible, surveyors would zigzag within their respective swaths in order to inspect areas of either high visibility such as exposed mineral soil or areas of high probability such as obvious trails or landmarks. Every thirty meters within the high probability ground each surveyor exposed to mineral soil a surface area of 1-x-1 meter square. Using GPS the survey crew mapped all newly discovered sites and isolated finds and monitored and GPS'd all the previously recorded sites within and adjacent to the proposed timber sale units.

3.16.3 Existing Condition—Heritage Resources

The prehistory and history of the North Santiam Subbasin and the Upper North Santiam Watershed have previously been summarized in *The Prehistory of the North Santiam Subbasin, on the Western Slopes of the Oregon Cascades* (Kelly 2001), and in the *Cultural Resource Overview of the Willamette National Forest, Western Oregon* (Minor 1987). These documents are of sufficient detail to serve as the basic reference of ethnographic and historic background for this report.

Ethnographic evidence suggests that highly mobile groups indigenous to the western Cascade Mountains lived during the winter along low elevation streams, accessing the uplands during the summer and fall to hunt game and gather berries and other important plant resources.

Extensive trail networks were important for traversing the Cascade Mountains, linking the Molala Indians with each other, surrounding tribes and important resource procurement and trade centers. The common activity at many of the sites is the manufacture and maintenance of lithic tools and biface reduction. The site distribution pattern within the Presley's Twin area suggests that past Indian groups camped at places associated with well-watered zones, such as live stream courses and meadows.

Plant food resources commonly used by Native Americans in the Presley Twins area include several types of huckleberries grouse huckleberry, big huckleberry, beargrass, blackberry, bunchberry, Oregon Grape, sedges, and bracken fern.

Historic use appears in the form of trails, early logging activity, and garbage dumps. The Santiam NF Maps (1911, 1913, 1923, and 1925) depict a trail leading from Lava Lake, through the eastern edge of the Parks, to Big Meadows, and north past Twin Meadows, Downing Creek and on to Independence Prairie, and to Marion Creek and the North Santiam River, continuing to present day Detroit following the North Santiam River. By 1937 the Willamette National Forest Map depicts this trail as a road (Road 2257 Big Meadows). The road was constructed by the Civilian Conservation Corp. The 1937 and the 1947 Willamette National Forest maps also reveals a way trail leading from Road 2257 near the Pine Ridge trail east to Highway 22.

3.16.4 Environmental Consequences – Heritage Resources

The field crew for the Presley's Twin Timber Sale project located five new heritage sites and seven new isolated finds. Previous surveys in the project area located eleven heritage sites and seventeen isolated finds within or adjacent to the selected timber stand units and their associated access routes. The site types recorded within the Presley's Twin project area include lithic scatters, historic garbage dump and a segment of a historic way trail.

The 16 archaeological sites are considered potentially eligible to the National Register of Historic Places (NRHP) and must be protected from project activities or evaluated to determine their eligibility to the NRHP.

State Historic Preservation Office consultation has been completed under the terms of the 1995 Programmatic Agreement (amended 2004).

Direct and Indirect Effects – Heritage Resources – Alternative 1

Implementation of the no action alternative would not directly nor indirectly affect heritage resources since there would be no change to the integrity of heritage resource sites.

Direct and Indirect Effects – Heritage Resources – Alternative 2

Implementation of alternatives 2 would not directly nor indirectly affect heritage resources. The potentially eligible sites have been protected by redesigning timber sale unit boundaries to protect the sites from Timber Harvest and associated project activities.

Direct and Indirect Effects – Heritage Resources – Alternative 3

Implementation of alternative 3 would not directly nor indirectly affect heritage resources. The potentially eligible sites have been protected by redesigning timber sale unit boundaries to protect the sites from Timber Harvest and associated project activities.

Direct and Indirect Effects – Heritage Resources – Alternative 4

Implementation of alternative 4 would not directly nor indirectly affect heritage resources. The potentially eligible sites have been protected by redesigning timber sale unit boundaries to protect the sites from Timber Harvest and associated project activities.

Cumulative Effects – Heritage Resources

It is not anticipated that there would be cumulative effects to the potentially eligible heritage resources in the Presley's Twin Project Area from any of the proposed actions. The following mitigation measures cover the maximum alternative and are designed to minimize any effects this project might have on heritage resources.

3.16.5 Conclusion and Rationale – Heritage Resources

The ground disturbance associated with the timber harvest and road construction may disturb or destroy unknown cultural resource sites. Surveys for the presence of cultural resources would be accomplished according to the National Historic Preservation Act of 1966, as amended and sites would be protected through avoidance.

The areas proposed for ground-disturbing activities have been surveyed a for the presence of cultural resources. Several areas containing these resources have been recorded. The action alternatives were either designed to avoid or exclude these areas from any management activities. The action alternatives would have no adverse effects to cultural resource (See Project Review for Heritage Resources form in the Analysis File). If any cultural sites are found during any proposed activity, the activity would be discontinued, and timber sale contract provisions would be invoked until the site is evaluated for significance and appropriate mitigation measures are performed.

3.17 Consistency with Direction and Regulation _____

All proposed action alternatives would comply with the following directions and regulations:

- Willamette National Forest Plan, including applicable Standards and Guidelines
- Northwest Forest Plan including applicable Standards and Guidelines
- The Record of Decision
- Clean Air Act
- Clean Water Act
- Endangered Species Act of 1973
- Wild and Scenic Rivers Act

- General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988).

Additional Direction and Regulations applicable to certain sections of this document include:

Resource Area	Direction and Regulation
Fire	State of Oregon Smoke Management Guidelines Northwest Oregon Fire Management Plan
Wildlife	Biological Assessments USFWS Biological Opinions Letters of concurrence
Hydrology & Fisheries	Aquatic Conservation Strategy Objectives Clean Water Act DEQ Sufficiency Analysis for Stream Temperature 303d Listing Executive Orders 11988 and 11990 Magnuson-Stevens Fishery Conservation and Management Act (MSA) 1996 Wild and Scenic Rivers Act Executive Orders 12962, 11988, and 11990
Heritage	National Historic Preservation Act

Other applicable Standards and Guidelines and/or Best Management Practices may exist which were not directly referenced in this document. Their exclusion does not indicate that they were overlooked or are inapplicable. As project development proceeds, appropriate constraints or mitigations may be added or changed in order to better meet the intent of adequate resource protection or enhancement as directed in the 1990 Willamette National Forest Land and Resource Management Plan and Final Environmental Impact Statement.

3.18 Irretrievable Irrevocable Commitment of Resources

None of the specialists consulted for this project anticipated any commitment of irretrievable or irrevocable resources.

4. Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

4.1 Interdisciplinary Team Members _____

Jim Romero, Project Team Leader (2004 to 2005)

Gary Marsh, Project Team Leader (to 10/2005)

Christy McDevitt, Project Team Leader (1/2006 to present)
Rich Hatfield, NEPA Specialist (2006 to present)
Darryl Whitmore, Wildlife Biologist
Dave Halemeier, Hydrologist
Doug Shank, Soil/Geologist
Wayne Sommes, Fish Biologist (to 6/2006)
Darren Cross, Fish Biologist (7/2006-present)
Mike Roantree, Botanist (1999-5/2007)
Chris Wagner Botanist (6/2007-Present)
Dani Pavoni, Recreation Planner
Nanci Curtis, Fuels Specialist
Paul Bennett, Road Engineer (to 6/2006)
Jim Windsor, Road Engineer (7/2006 to 12/2006)
Josh Latham, Road Engineer (1/2007 to present)
Cara Kelly, Archeologist
Allan Raines, Logging Specialist
Dave Leach, Silviculturalist (to 1/2007)

4.2 Federal, State and Local Agencies _____

For this project, formal consultation with the U.S. Fish and Wildlife Service was completed and a Biological Opinion 1-7-06-F-0179 was received September 2006. For Northern Spotted Owls “may affect and not likely to adversely affect” determination was made for effects of disturbance from habitat modification project activities. A “may affect and likely to adversely affect” determination was made for effects of habitat modification (USDI, 2006).

Consultation with US Fish and Wildlife Service for fisheries was not required since bull trout habitat does not exist in the Upper North Santiam Watershed. In addition, consultation with NOAA Fisheries was not required because this undertaking would have no effect on ESA-listed anadromous fish species or critical habitat.

Under the Programmatic Agreement among the USDA, Forest Service Pacific Northwest (Region 6), The Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (2204) the North End Forest Heritage Specialist has project review authority, and certifies that the project complies with Section 106 of the National Historic Preservation Act. That certification of the project as “No Historic Properties Affected” was completed in June 2007.

4.3 Tribes _____

Government-to-government consultation regarding this project was conducted with the Confederated Tribes of Grand Ronde Community on 6/2/2002, 2/27/2003, 2/26/2004, 3/10/2005,

2/23/2006, and 3/10/2007 and with the Confederated Tribes of Siletz Indians on 3/12/2003, 3/17/2004, 3/16/2005, 3/15/2006, and 4/18/2007. No comments were received regarding this project at any of these meetings. In addition, during the scoping of issues and concerns, as part of the public participation process, letters were mailed to tribal governments in July 2005. No issues were raised regarding the proposed project as a result of that mailing.

4.4 Elected Officials _____

Mayor Connie Lamont, City of Detroit

Mayor Tim Kirsch, City of Mill City

Mayor, City of Idahna

Travis Hammond-Brouwer, Staff for United States Representative Darlene Hooley

4.5 Individuals and Organizations _____

Scoping comments were received in response to the scoping letter from Oregon Natural Resources Council (now Oregon Wild), Cascadia Wildlands Project, Rocky Mountain Elk Foundation, Backcountry Horsemen, and State of Oregon Department of Fish and Wildlife. In addition, five scoping comments were received from members of the public.

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Appendix A – Botanical Biological Evaluation



United States
Department of
Agriculture

Forest
Service

Willamette National Forest
Detroit Ranger District

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File Code: 2670

Date: 2/18/2007

Route To:

Subject: Botanical Biological Evaluation for Presley's Twin Timber Sale

To: Christy McDevitt/Project Files

Michael Roantree, Botanist Michael Roantree Date February 18, 2007

Introduction

Forest management activities that may impact populations of or alter habitat for PETS (proposed, endangered, threatened, or sensitive) species require a Biological Evaluation (FSM 2671.44) to be completed. The Biological Evaluation process (FSM 2672.43) is used to assist in determining the possible effects the proposed management activities have on:

- A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the U.S. Fish and Wildlife Service (FWS).
- B. Species listed as sensitive (S) by the USDA Forest Service, Region 6. There are 72 plants listed on the Regional Forester's Sensitive Plant List that are documented or suspected to occur on the Willamette National Forest (Attachment 1).

Project Location and Description

This project area is in the Upper North Santiam watershed located approximately 14 miles southeast of Detroit, Oregon and about 9 miles north of the junction of State Highways 20 and 22. The legal description of the area is T12S, R7E, Sections 2-4, 9-11, and 14-16 of the Willamette Meridian.

This project proposes to: harvest timber on about 1,842 acres of managed and mature stands. The following activities are associated with this project:

1. Overstory removal of approximately 1,000 acres of managed shelterwood plantations.
2. Thinning 162 acres of 40-year-old managed plantations and 680 acres of 100-150 year old stands.
3. Construction of about 2.0 miles of temporary spur road to access harvest unit landings.
4. Road maintenance and reconstruction activities on about 20.0 miles of existing classified roads.
5. Repair and reinforcement of about 10 road closure gates and barriers.
6. Fuel reduction treatments, such as hand and machine piling and burning, and prescribed under burning on about 1,000 acres.

7. Precommercial thinning of 800 acres of managed shelterwood plantations. Precommercially thinned stands may also be fertilized.
8. Removal of about 18 MMBF of merchantable timber.

Biological Evaluation Process

Under the suggested procedure for conducting a biological evaluation as described in a memo issued August 17, 1995 by the Regional Foresters of regions 1, 4, and 6, the Biological Evaluation is a 7 step process to evaluate possible effects to Proposed, Endangered, Threatened, and Sensitive (PETS) species. The seven steps are as follows:

1. Review of existing documented information.
2. Field reconnaissance of the project area.
3. Determination of effects of proposed actions on PETS species
4. Determination of irreversible or irretrievable commitment of resources (required for listed and proposed species only).
5. Determination of conclusions on effects
6. Recommendations for removing, avoiding, or compensating adverse effects
7. Documentation of consultation with other agencies, references, and contributors

Evaluation of effects for each species may be complete at the end of step #1 or may extend through step #5, depending on project details.

Steps 1, 2, 3, and 5 from above are included in this document. The other steps are included in the Environmental Assessment, and will not be discussed in detail in this document.

Evaluation and Survey of the Planning Area

Pre-field review was performed for the Presley's Twin planning area in the summer of 2004 in order to determine the presence of known sites or habitat for PETS species. Using the current list of potential PETS species (compiled from USFWS listings, Oregon Natural Heritage Program listings, Oregon Department of Agriculture listings, and the Regional Forester's sensitive species list), maps of known sensitive plant populations were checked for previously reported sites and aerial photos and topographical maps were scrutinized for potential habitat.

In areas where pre-field review identified potential habitat, field reconnaissance was done in accordance with established protocols and level of detail (see attachment 2). Surveys were done during the summer of 2004, and summer and fall of 2006. All acreage in the planning area was field surveyed at level B intensity.

Table 1 displays the results of pre-field review, the level of field surveys performed (if applicable), and the results of the surveys.

Table 1a: Summary of Evaluation Process for PETS Botanical Species in 3 Pools Project Area for surveyable species

Species	Prefield Review	Field Recon.	Species Presence
<i>Agoseris elata</i>	habitat present	level B, mod	no
<i>Arabis hastatula</i>	habitat not present		

Species	Prefield Review	Field Recon.	Species Presence
<i>Arnica viscosa</i>	habitat not present		
<i>Asplenium septentrionale</i>	habitat not present		
<i>Aster gormanii</i>	habitat not present		
<i>Botrychium minganense</i>	habitat not present		
<i>Botrychium montanum</i>	habitat not present		
<i>Botrychium pumicola</i>	habitat not present		
<i>Bridgeporus nobillissimus</i>	habitat not present		
<i>Calamagrostis breweri</i>	habitat not present		
<i>Carex scirpoidea</i> var. <i>stenochlaena</i>	habitat not present		
<i>Carex livida</i>	habitat not present		
<i>Castilleja rupicola</i>	habitat not present		
<i>Chaenotheca subroscida</i>	habitat not present		
<i>Cimicifuga elata</i>	habitat not present		
<i>Coptis trifolia</i>	habitat not present		
<i>Corydalis aqua-gelidae</i>	habitat present	level B, mod	no
<i>Dermatocarpon luridum</i>	habitat not present		
<i>Eucephalis</i> (<i>Aster</i>) <i>vialis</i>	habitat not present		
<i>Frasera umpquaensis</i>	habitat present	level B, mod	no
<i>Gentiana newberryi</i>	habitat not present		
<i>Hypogymnia duplicata</i>	habitat present	level B, mod	no
<i>Iliamna latibracteata</i>	habitat not present		
<i>Leptogium burnetiae</i> var. <i>hirsutum</i>	habitat not present		
<i>Leptogium cyanescens</i>	habitat not present		
<i>Lewisia columbiana</i> not present var. <i>columbiana</i>	habitat not present		
<i>Lobaria linita</i>	habitat not present		
<i>Lupinus sulphureus</i> var. <i>kincaidii</i>	habitat not present		
<i>Lycopodiella inundata</i>	habitat not present		
<i>Lycopodium complanatum</i>	habitat present	level B, high	no
<i>Montia howellii</i>	habitat not present		
<i>Nephroma occultum</i>	habitat present	level B, high	yes
<i>Ophioglossum pusillum</i>	habitat present	level B, high	no
<i>Pellaea andromedaefolia</i>	habitat not present		
<i>Pannaria rubiginosa</i>	habitat not present		
<i>Peltigera neckeri</i>	habitat present	level B, high	no
<i>Peltigera pacifica</i>	habitat not present		
<i>Pilophorus nigricaulis</i>	habitat not present		

Species	Prefield Review	Field Recon.	Species Presence
<i>Polystichum californicum</i>	habitat not present		
<i>Potentilla villosa</i>	habitat not present		
<i>Pseudocyphellaria rainierensis</i>	habitat present	level B, high	no
<i>Ramalina pollinaria</i>	habitat not present		
<i>Rhizomnium nudum</i>	habitat present	level B, high	no
<i>Romanzoffia thompsonii</i>	habitat not present		
<i>Scheuchzeria palustris</i> var. <i>americana</i>	habitat not present		
<i>Schistostega pennata</i>	habitat not present		
<i>Scirpus subterminalis</i>	habitat not present		
<i>Scouleria marginata</i>	habitat not present		
<i>Sisyrrinchium sarmentosum</i>	habitat not present		
<i>Tetraphis geniculata</i>	habitat not present		
<i>Tholurna dissimilis</i>	habitat not present		
<i>Usnea longissima</i>	habitat not present		
<i>Utricularia minor</i>	habitat not present		
<i>Wolffia borealis</i>	habitat not present		
<i>Wolffia columbiana</i>	habitat not present		

Table 1b: Summary of Evaluation Process for PETS Botanical Species in 3 Pools Project Area for species deemed unsurveyable

Group	Species	Prefield Review/Rationale
Mycorrhizal Fungi	<i>Boletus pulcherrimus</i>	level A, low / rare, no info
	<i>Cortinarius barlowensis</i>	level A, mod / local, no info
	<i>Gomphus kaufmanii</i>	level A, mod / local, no info
	<i>Leucogaster citrinus</i>	level A, mod / local, no info
	<i>Phaeocollybia attenuata</i>	level A, low / not local, no info
	<i>Phaeocollybia dissiliens</i>	level A, mod / local, no info
	<i>Phaeocollybia pseudofestiva</i>	level A, mod / local, no info
	<i>Phaeocollybia sipei</i>	level A, mod / local, no info
	<i>Ramaria amyloidea</i>	level A, low / not local, no info
	<i>Ramaria aurantiisiccescens</i>	level A, mod / local, no info
	<i>Ramaria gelatiniaurantia</i>	level A, mod / local, no info
Saprophytic on Litter Fungi	<i>Ramaria largentii</i>	level A, mod / local, no info
	<i>Cudonia monticola</i>	level A, mod / local, no info
	<i>Mycena monticola</i>	level A, mod / local, no info
	<i>Sowerbyella rhenana</i>	level A, mod / local, no info

Saprophytic on Wood	<i>Gyromitra californica</i>	level A, mod / local, no info
Parasitic Fungi	<i>Cordyceps capitata</i>	level A, mod / local, no info

Effects by Alternative

Alternatives:

1. No Action
2. Proposed Action (Commercial Thin + Overstory Removal)
3. Commercial Thin
4. Overstory Removal

The summary above (Table 1) concludes that potential habitat exists for ten sensitive species within the project area, three of these species occur within the watershed, and two were located during project area survey. These species are generally associated with old growth Douglas-fir forests, or mature forests that contain remnant old growth Douglas-fir. The one lichen and two fungi and habitats are:

Cudonia monticola (f): On *Picea* needles and coniferous debris in late summer and autumn.

Gyromitra californica (f): On or adjacent to well-rotted stumps or logs of coniferous trees or on soil rich in brown rotted wood.

Nephroma occultum (l): Conifer boles and branches, mostly mid to upper canopy, found in litter.

Alternative 1

Direct, Indirect, and Cumulative Effects – Surveys in the summer of 2004 found evidence of the occurrence of two Region 6 sensitive plant species. Although found in the project area, neither site will be impacted by proposed project work. Under Alternative 1, no acres would be subject to overstory removal or be thinned. The proposed thinning stands would undergo a slow decline before presumably opening up enough to provide more understory species development. Windthrow, snowdown, and insect and disease pockets would create openings. Coarse woody debris would be abundant as trees die due to overcrowding. In proposed overstory removal stands, larger trees left for moderation of microclimate would remain. Direct, indirect, and cumulative effects, both beneficial and detrimental, to sensitive botanical species would likely be negligible based on the lack of occupied habitat found during survey. Alternative 1 would provide the most benefit to sensitive fungi because most of them form mycorrhizal relationships with conifers and thinning has been shown to have negative short term (5-7 years) impacts to fungi (Pilz et al 2003).

Alternative 2

Direct and Indirect Effects –Results of the Biological Evaluation and survey indicates an absence of sensitive botanical species occurrence in the project area and supports an assessment of low risk to these species from project implementation. It is likely that individual sites of fungi may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and disruption of mycelial networks if the fungi are present (Kranabetter and Wylie 1998, Amaranthus and Perry 1994). Twelve of the sensitive fungi are mycorrhizal and require a host plant. Reductions in the number of fruiting bodies of chanterelles, a common mycorrhizal

species, were noted after initial thinning but appear to rebound after several years (*Pilz et al 2003*). Alternative 2 will remove much of the overstory on 921 acres, and thin 747 acres. Alternative 3 proposes to only thin 747 acres, while Alternative 4 only proposes overstory removal on 921 acres. Given this, Alternative 2 would likely have a greater direct impact on fungi if they occur in these stands. Alternative 3 would have the next greatest impact on fungi, since habitat in these thinning stands contains more organic debris, is more mature, moister, more sheltered, and is generally more conducive to fungal development than the overstory removal stands. Although individual and short term impacts may occur in any of the action alternatives, it is not likely to result in a trend toward Federal listing or loss of viability for survey and manage and sensitive fungi species.

Indirect effects to survey and manage and sensitive species and their habitats vary. Minor forest tree species are favored over Douglas-fir in some unit prescriptions. This should lead to an increase in stand complexity and diversity over the long term (20-100 years). In the short term, all the action alternatives may reduce habitat for sensitive mycorrhizal fungi due to potential host tree removal and a reduction in moisture retention capabilities due to the drying effect of thinning and overstory removal. Risk will go up with type and degree of disturbance (Alt. 2 > Alt. 3 > Alt. 4). The 21 acres of clearcuts with reserves proposed in Alternatives 2 and 4 is the most efficient method of converting these dense acres and root rot pockets into future late-successional and disease resistant habitat. However, two studies have shown that fungal species richness declines in forest openings (*Durall, et al, 1999, Kranabetter and Wylie 1998*). There is an optimal amount of organic debris and of moisture and too little or too much of either can be detrimental (*Harvey, et.al. 1981; O'Dell, et.al. 1999*). Soil compaction resulting from harvesting equipment and the creation of temporary access roads can reduce host tree root growth and root tip availability for fungi (*Amaranthus, et.al. 1996; Amaranthus and Perry 1994; Williamson and Neilson 2000*). Additionally, thinning may affect lichens by removing substrate and altering the microclimate (*Sarr et. al. 2005*). Some survey and manage lichens are thought to be dispersal limited rather than sensitive to microclimatic changes (*Sillett 1995*). Despite these possible effects, thinning would take place in such a way to enhance late-successional characteristics over the long term. This includes greater diversity in stand structure and stand species. *Kranabetter and Kroeger (2001)* note that thinning prescriptions that leave some stand basal area with good tree vigor may accommodate both commercial timber harvest and mycorrhizal fungi. The development of understory trees and shrubs may benefit the sensitive mycorrhizal species. Duff retention and coarse woody debris creation would benefit both the sensitive mycorrhizal and saprophytic species (*Lindblad 1998*).

Cumulative Effects – The area analyzed for cumulative effects is the 46,220 acres that comprise Marion Creek and Straight Creek subwatersheds. Approximately 7,500 acres of old-growth forest was clear-cut and 5,000 acres salvage or otherwise partial cut in these subwatersheds from 1950 to 1990. Additionally, approximately 1600 acres were shelterwood harvested, and 850 acres were commercially thinned. These forests may have contained multiple populations of survey and manage and sensitive botanical species, most likely old growth dependent species such as *Pseudocyphellaria rainierensis* and *Nephroma occultum*. Fungal diversity declines with clear-cutting and fire (*Byrd, et al 2000, Bruns, et al 2002*), and most all of the stands were treated after harvest (e.g., prescribed pile and broadcast burning). Two wilderness wildfires (B&B-2003 and Puzzle-2006) have burned over 17,000 acres in the eastern boundary of the analysis area. Despite the combined acreage of past harvest and wildfire activity, there are 11,700 acres of mature and old-growth forests still remaining in the subwatersheds, including unburned

wilderness acres. These forests serve as refugia for many survey and manage and sensitive species that would be available to re-colonize the younger stands as they mature and become more complex in structure and diversity.

Potential Effects on PETS Species

Potential effects are listed in accordance with the formats put forth for listed species in the 1986 Endangered Species Act regulations (50 CFR Part 402), the March 1998 FWS/NMFS Endangered Species Consultation Handbook; and, for sensitive species, in the Forest Service Manual section 2670 and in the May 15 and June 11, 1992 Associate Chief/RF 2670 letters on this topic. The suggestion to use this format was also included in a memo issued August 17, 1995 by the Regional Foresters of Regions 1, 4, and 6. Attachment 3 gives details on these effects categories. Table 2 shows conclusions for effects of proposed actions on sensitive species with respect to each alternative in the Environmental Assessment. More detailed information on potential project effects on PETS species is found in the Environment Assessment for the project.

Table 2: Summary of Conclusion of Effects

Species	Alt. 1	Alt. 2
Agoseris elata	NI	NI
Corydalis aqua-gelidae	NI	NI
Cudonia monticola	NI	NI
Frasera umpquaensis	NI	NI
Gyromitra californica	NI	NI
Hypogymnia duplicata	NI	NI
Lycopodium complanatum	NI	NI
Nephroma occultum	NI	NI
Ophioglossum pusillum	NI	NI
Peltigera neckeri	NI	NI
Pseudocyphellaria rainierensis	NI	NI
Rhizomnium nudum	NI	NI

Key to Abbreviations in Table 2 (See attachment 3)

NI = No Impact

MIH = May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability for the Population or Species

WOFV* = Will Impact Individuals or Habitat with a Consequence That the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability for the Population or Species

BI = Beneficial Impact

*Considered a trigger for a significant action in NEPA

ATTACHMENT 1: Regional Forester's Sensitive Botanical Species List for the Willamette National Forest (2006)

Species	Occurrence on WNF	ONHP Status	State Status	Federal Status	Habitat Types
<i>Agoseris elata</i>	S	2			MM,DM
<i>Arabis hastatula</i>	D	1		SofC	RO
<i>Arnica viscosa</i>	S	2			RS
<i>Asplenium septentrionale</i>	S	2			RO
<i>Aster gormanii</i>	D	1			RS
<i>Boletus pulcherrimus</i>	D	1			CF
<i>Botrychium minganense</i>	D	2			RZ,CF
<i>Botrychium montanum</i>	D	2			RZ,CF
<i>Botrychium pumicola</i>	S	1	LT		HV
<i>Bridgeoporus nobilissimus</i>	D	1			CF
<i>Calamagrostis breweri</i>	D	2			MM,RZ
<i>Carex livida</i>	S	2			WM
<i>Carex scirpoidea</i>	D	2			RO
<i>var. stenochlaena</i>					
<i>Castilleja rupicola</i>	D	2			RO
<i>Chaenotheca subroscida</i>	D	3			CF
<i>Cimicifuga elata</i>	D	1	C		CF
<i>Coptis trifolia</i>	S	2			WM,CF
<i>Cordyceps capitata</i>	D	unlisted			CF
<i>Cortinarius barlowensis</i>	D	2			CF
<i>Corydalis aqua-gelidae</i>	D	1	C		RZ,CF
<i>Cudonia monticola</i>	D	not listed			CF
<i>Dermatocarpon luridum</i>	S	3			RZ on rock
<i>Eucephalis (Aster) vialis</i>	S	1	LT	SofC	CF
<i>Frasera umpquaensis</i>	D	1	C		MM
<i>Gentiana newberryi</i>	D	2			MM
<i>Gomphus kaufmanii</i>	D	3			CF
<i>Gyromitra californica</i>	D	2			CF
<i>Hypogymnia duplicata</i>	S	3			CF
<i>Iliamna latibracteata</i>	S	2			CF,RZ
<i>Leptogium burnetiae</i>					
<i>var. hirsutum</i>	S	3			CF
<i>Leptogium cyanescens</i>	D	3			CF
<i>Leucogaster citrinus</i>	D	3			CF
<i>Lewisia columbiana</i>	D	2			RS
<i>var. columbiana</i>					
<i>Lobaria linita</i>	D	2			RO
<i>Lupinus sulphureus</i>					
<i>var. kincaidii</i>	S	1	LT	LT	MM,DM
<i>Lycopodiella inundata</i>	D	2			WM
<i>Lycopodium complanatum</i>	D	2			CF
<i>Montia howellii</i>	D	4	C		RZ
<i>Mycena monticola</i>	D	not listed			CF

Species	Occurrence on WNF	ONHP Status	State Status	Federal Status	Habitat Types
<i>Nephroma occultum</i>	D	4			CF
<i>Ophioglossum pusillum</i>	D	2			WM
<i>Pannaria rubiginosa</i>	D	2			CF
<i>Pellaea andromedaefolia</i>	S	2			RO
<i>Peltigera neckeri</i>	D	not listed			CF
<i>Peltigera pacifica</i>	D	not listed			CF
<i>Phaeocollybia attenuata</i>	D	4			CF
<i>P. dissiliens</i>	D	3			CF
<i>P. pseudofestiva</i>	D	3			CF
<i>P. sipei</i>	D	3			CF
<i>Pilophorus nigricaulis</i>	D	2			RO
<i>Polystichum californicum</i>	D	2			RO
<i>Potentilla villosa</i>	D	2			RS, RO
<i>Pseudocyphellaria rainierensis</i>	D	4			CF,RZ
<i>Ramalina pollinaria</i>	D	2			CF, RZ
<i>Ramaria amyloidea</i>	D	2			CF
<i>R. aurantiisiccescens</i>	D	4			CF
<i>R. gelatiniaurantia</i>	D	3			CF
<i>R. largentii</i>	D	3			CF
<i>Rhizomnium nudum</i>	D	2			CF
<i>Romanzoffia thompsonii</i>	D	1			RS
<i>Scheuchzeria palustris var. americana</i>	D	2			WM
<i>Schistostega pennata</i>	D	2			CF
<i>Scirpus subterminalis</i>	D	2			SW
<i>Scouleria marginata</i>	S	3			RZ
<i>Sisyrrinchium sarmentosum</i>	S	1	C	SofC	MM,DM
<i>Sowerbyella rhenana</i>	D	3			CF
<i>Tetraphis geniculata</i>	S	2			CF
<i>Thorluna disimilis</i>	D	2			CF
<i>Usnea longissima</i>	D	3			CF,RZ
<i>Utricularia minor</i>	D	2			SW
<i>Wolffia borealis</i>	S	2			SW
<i>Wolffia columbiana</i>	S	2			SW

Occurrence on Willamette National Forest:

S = Suspected

D = Documented

Oregon Natural Heritage Program (ORNHP):

1 = Taxa threatened or endangered throughout range.

2 = Taxa threatened or endangered in Oregon but more common or stable elsewhere.

3 = Species for which more information is needed before status can be determined, but which may be threatened or endangered (Review).

4 = Species of concern not currently threatened or endangered (Watch).

Oregon State Status:

LT = Threatened

LE = Endangered

C = Candidate

Federal Status: These plant species were originally published as CANDIDATE THREATENED (CT) in the Smithsonian Report, **Federal Register**, July 1, 1975, or as PROPOSED ENDANGERED (PE) in a later report, **Federal Register**, June 16, 1976. The latest **Federal Register** consulted was dated September 30, 1993. Updated listings appear periodically in the Notice of Review (USFWS); the status of several species is categorized as follows:

LE = Listed as an Endangered Species

LT = Listed as a Threatened Species

PE = Proposed as an Endangered Species

PT = Proposed as a Threatened Species

C = Candidate for Listing as Threatened or Endangered

SofC = Species of Concern; taxa for which additional information is needed to support proposal to list under the ESA.

Habitat Types:

MM = Mesic meadows

RS = Rocky slopes, scree

WM = Wet meadows

RO = Rock outcrops, cliffs

DM = Dry meadows

DW = Dry open woods

RZ = Riparian zones, floodplains

HV = High volcanic areas

CF = Coniferous forest

SW = Standing water

ATTACHMENT 2: Field reconnaissance survey levels for determining presence potential for TES species.

Level A: Aerial photo interpretation and review of existing site records.

Determination of the potential for a listed species to occur within the proposed project area. No field surveys completed.

Low potential: Less than 40% potential for listed species inhabiting the project area.

Moderate potential: 40-60% potential for a listed species inhabiting the proposed project area.

High potential: Greater than 60% potential for listed species inhabiting the proposed project area.

Level B: Single entry survey of probable habitats. Areas are identified by photos and existing field knowledge. Field surveys are conducted during the season most favorable for species identification.

Low intensity: Selected habitat surveys (approximately 5-10% of area) are conducted with a single entry for listed species inhabiting the proposed project area.

Moderate intensity: Selected habitat surveys (approximately 10-40% of area) are conducted with a single entry for listed species inhabiting the proposed project area.

High intensity: Selected habitat surveys (approximately 40-60% of area) are conducted with a single entry for listed species inhabiting the proposed project area.

Level C: Multiple entry surveys are conducted for listed species likely to inhabit the proposed project area.

Low intensity: Selected habitat surveys (approximately 5-10% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.

Moderate intensity: Selected habitat surveys (approximately 10-60% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.

High intensity: Selected habitat surveys (approximately 60-80% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.

ATTACHMENT 3: Conclusions Of Effects For Use In Biological Evaluations and Assessments USDA Forest Service - Regions 1, 4, and 6 (August, 1995)

Listed Species:

1. No Effect

Occurs when a project or activity will not have any “effect”, on a listed species, or critical habitat.

2. May Affect - Likely to Adversely Affect (LAA)

If the determination in the biological assessment is that the project May Affect - Likely to Adversely Affect a listed species or critical habitat, formal consultation must be initiated (50 CFR 402.12). Formal consultation must be requested in writing through the Forest Supervisor (FSM 2670.44) to the appropriate FWS Field Supervisor, or NOAA Fisheries office.

3. May Affect - Not Likely to Adversely Affect (NLAA)

If it is determined in the biological assessment that there are “effects” to a listed species or critical habitat, but that those effects are not likely to adversely affect listed species or critical habitat, then written concurrence by the FWS or NOAA Fisheries is required to conclude informal consultation (50 CFR 402.13).

4. Beneficial Effect

Written concurrence is also required from the FWS or NOAA Fisheries if a beneficial effect determination is made.

Requests for written concurrence must be initiated in writing from the Forest Supervisor to the State Field Supervisor (FWS or NOAA).

Proposed Species:

Whenever serious adverse effects are predicted for a proposed species or proposed critical habitat, conferencing is required with the FWS or NOAA Fisheries.

1. No Effect

When there are “no effects” to proposed species, conferencing is not required with FWS or NOAA.

2. Not Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion is used where there are effects or cumulative effects, but where such effects would not have the consequence of losing key populations or adversely affecting “proposed critical habitat”. No conferencing is required with FWS or NOAA if this conclusion is made. However, for any proposed activity that would receive a “Likely To Adversely Affect” conclusion if the species were to be listed, conferencing may be initiated.

3. Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion must be determined if there are significant effects that could jeopardize the continued existence of the species, result in adverse modification or destruction of proposed critical habitat, and/or result in irreversible or irretrievable commitments of resources that could foreclose options to avoid jeopardy, should the species be listed. If this is the conclusion, conferencing with FWS or NMFS is required.

Sensitive Species:

1. No Impact (NI)

A determination of “No Impact” for sensitive species occurs when a project or activity will have no environmental effects on habitat, individuals, a population or a species.

2. May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (MIIH)

Activities or actions that have effects that are immeasurable, minor or are consistent with Conservation Strategies would receive this conclusion. For populations that are small - or vulnerable - each individual may be important for short and long-term viability.

3. Will Impact Individuals or Habitat With a Consequence That the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (WIFV)

Loss of individuals or habitat can be considered significant when the potential effect may be:

Contributing to a trend toward Federal listing (C-1 or C-2 species);

Results in a significantly increased risk of loss of viability for a species; or,

Results in a significantly increased risk of loss of viability for a significant population (stock).

4. Beneficial Impact (BI)

Projects or activities that are designed to benefit, or that measurably benefit a sensitive species should receive this conclusion.

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and Other Mitigation Measures Standards and Guidelines.

U. S. Department of Agriculture, U. S. Department of Interior. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines.

Results of Pre-field Review and Field Reconnaissance for Survey and Manage Plant Species (Willamette National Forest: FY 2006)

Project Name: Presley's Twin Timber Sale

Legal Location: Township 12S, Range 7E, Sections 2-4, 9-11, and 14-16

Is the project ground disturbing? Yes (if yes, then conduct survey) No (if no, then document in project file)

Species	Habitat Present? (Y/N)	Date Surveyed	Surveyor(s) Name(s)	Species Located? (Y/N)	Additional Survey Needs? When and Where?
<i>Botrychium minganense</i>	N				
<i>Botrychium montanum</i>	N				
<i>Bridgeoporus nobilissimus</i>	N				
<i>Coptis trifolia</i>	N				
<i>Corydalis aqua-gelidae</i>	Y	Summer & Fall, 2004 & 2006	Roantree and Smith	N	
<i>Cypripedium montanum</i>	N				
<i>Dendriscoaulon intricatulum</i>	N				
<i>Eucephalus vialis</i>	N				
<i>Hypogymnia duplicata</i>	Y	Summer & Fall, 2004 & 2006	Roantree and Smith	N	
<i>Leptogium cyanescens</i>	N				
<i>Lobaria linita var. tenuoir</i>	N				
<i>Marsupella emarginata var. aquatica</i>	N				
<i>Nephroma occultum</i>	Y	Summer & Fall, 2004 & 2006	Roantree and Smith	Y	N
<i>Pseudocyphellaria rainierensis</i>	Y	Summer & Fall, 2004 & 2006	Roantree and Smith	N	
<i>Schistostega pennata</i>	N				
<i>Tetraphis geniculata</i>	N				
<i>Thorluna disimilis</i>	N				
<i>Tritomeria exsectiformis</i>	N				

Signature:

Mike Roantree
Botanist

03/01/2007
Date

Appendix B – Wildlife Biological Evaluation



United States
Department of
Agriculture

Forest
Service

Willamette National Forest
Detroit Ranger District

HC 73 Box 320
Mill City, OR 97360
Tel (503) 854-3366
FAX (503) 854-4239

File 2670
Code:
Route
To:

Date: April 24, 2007

Subject: Biological Evaluation for Presley's Twin Timber Sale

To: Paul Matter/Project Files

Daryl Whitmore, Wildlife Biologist _____ Date _____

Summary of Effects Determinations:

U.S. Forest Service, Region 6, Sensitive Species

1. Baird's shrew - The proposed project may impact the Baird's shrew or its habitat. The proposed project may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.
2. Pacific shrew - The proposed project may impact the Pacific shrew or its habitat. The proposed project may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.
3. Oregon slender salamander - The proposed project may impact the Oregon Slender salamander or its habitat. The proposed project may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.
4. Pacific Fringe Tailed Bat - The proposed project may impact the Pacific fringe-tailed bat or its habitat. The proposed project may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.

The proposed project will have no impact on other U.S. Forest Service sensitive species.

Federally Threatened, Endangered and Proposed for listing species

5. Northern Spotted Owl – May affect and likely to adversely affect habitat where suitable habitat is removed or downgraded. May affect and not likely to adversely effect habitat where dispersal is removed or degraded or suitable habitat is degraded. May affect and not likely to adversely affect or no affect to spotted owls by disturbance. No activities which are may affect and are likely to adversely affect spotted owls by disturbance are proposed for the project.

The proposed project will have no effect on other Federally listed or proposed species.

Summary of mitigation/restrictions:

1. Northern Spotted Owl - The following requirements comply with terms and conditions as stated in Biological Opinion 1-7-06-F-0179 for activities that have the potential to adversely affect northern spotted owls, due to habitat modification and disturbance.

The hauling and removal of hazard trees for public safety are not seasonally restricted. Otherwise, project related activities involving chainsaws are prohibited within 65 yards of known spotted owl activity centers from March 1 – July 15. Heavy equipment use is prohibited within 35 yards of spotted owl activity centers during that time. Post-harvest burning is prohibited within 0.25 miles of known activity centers from March 1 – July 15. However, post-harvest prescribed burning may take place during the critical breeding period if the unit falls within .25 miles of unsurveyed suitable habitat when no activity center is present. These restrictions do not apply to known activity centers or other suitable habitat that are surveyed to protocol and found to be unoccupied or have no nesting activity.

Chainsaw and heavy equipment use is not restricted within any proposed harvest units. The location of known activity centers are isolated from road systems and harvest units and no proposed activities will occur within the 65 yard disruption distance. Consult the district wildlife biologist prior to initiating any activities not described above or in the proposed action, such as whistles on yarding equipment and activities outside harvest units, which produce noise above ambient levels and may disrupt spotted owl nesting.

Introduction

This report provides the Biological Evaluation (BE) for wildlife, including terrestrial insects and mollusks, for Forest Service (FS) sensitive species and federally listed threatened, endangered, and proposed species for the Presley’s Twin project. Forest Service policy regarding BE’s for sensitive species is stated in FSM 2672.4 as follows: “Review all FS planned, funded, executed, or permitted programs and activities for possible effects on sensitive species. The Biological Evaluation is the means of conducting the review and documenting the findings.” Forest Service Manual 2670 also provides direction on the review, actions, and programs authorized, funded or implemented by the Forest Service relative to the requirements of the Endangered Species Act (ESA). This BE addresses the potential impacts on federally listed Threatened (FT), Endangered (FE), and Proposed species for the Presley’s Twin project. Fish and plant species are addressed in separate BE’s prepared by the project fish biologist and botanist respectively.

Proposed Management Action

The **Presley’s Twin** project is a proposed timber management project in township 11 south, range 7 east, sections 2-4, 9-11, 15 & 16 of the Willamette Meridian in the Upper North Santiam Watershed. The project is approximately 14 miles southeast of Detroit, Oregon and about 9 miles north of the junction of State Highways 20 and 22.

Four alternatives are proposed for the Presley’s Twin project. Alternative 1 is the no action proposal. Alternative 2 is shelterwood removal, shelterwood harvest, regeneration harvest, thinning and post and pole proposal. Alternative 3 is thinning and post and pole harvests. Alternative 4 is shelterwood removal, shelterwood harvest and regeneration harvest.

The purpose of the proposed action is to improve growth and vigor of the stands, maintain an environmentally sound road network, increase habitat diversity to meet riparian objectives, and to provide a sustainable supply of wood products.

The purpose and need for the proposed action is directed by the Land and Resource Management Plan (LRMP) of the Willamette National Forest as amended by the Record of Decision for the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (NWFP). This document provides direction based on designated management areas (MA) and associated standards and guidelines (S&G). Biological Opinion (BO) 1-7-06-F-0179 issued by the United States Fish and Wildlife Service (USFWS) provides direction for mitigation measures.

Design criteria to mitigate impacts or provide beneficial effects to TEPS species is not required. The project as proposed does not require mitigation measures to comply with LRMP standards and guidelines or the management standards as described in the BO.

This biological evaluation addresses the potential effects of the proposed project on Threatened, Endangered, Proposed for listing or Sensitive species listed in the R-6 Sensitive Species List

dated 07/21/2004. Analysis of effects of this proposed project on Federally listed Threatened, Endangered and Proposed species ensures compliance with the provisions of the Endangered Species Act of 1973, P.L. 93-205 (87 Stat. 884), as amended.

All Actions are taken to ensure that management activities do not jeopardize the continued existence of sensitive species or result in an adverse modification of their essential habitat (FSM 2670.3, Region-6 ID 2670-92-1, 1/91).

Species Considered and Species Evaluated

Table 1 lists the species initially considered for analysis along with their habitat needs.

Table 1. Summary of Ecological Requirements for Animal Species on the Regional Forester's Federally Listed and Sensitive Species Lists for species with documented or suspected occurrence on the Willamette National Forest (July 21, 2004).

Species	Habitat
Northern Spotted Owl <i>Strix occidentalis</i> <i>Status: Federally Threatened and Critical Habitat designated</i>	Occur primarily in the interior of older timber stands with structure required for food, cover, nest sites, and protection from weather and predation. Reproductive habitat = forest w/ canopy closure 60 – 80%; multi-layered, multi-species canopy dominated by large overstory trees (> 30" dbh); abundant large trees w/deformities (e.g. large cavities, broken tops, dwarf-mistletoe infections, decadence); abundant large snags/down logs; and sufficient open flying space below the canopy. Foraging habitat = forest w/ > 2 canopy layers; overstory trees > 21" DBH; abundant snags/down wood; and a 60-80% canopy closure. Dispersal habitat = forest w/ > 11" DBH trees and > 40% canopy closure. Numerous sightings and occupied territories have been recorded on the Detroit RD.
Northern Bald Eagle <i>Haliaeetus leucocephalus</i> <i>Status: Federally Threatened</i>	Use scattered old-growth conifer trees in proximity to open water near rivers, lakes, and reservoirs with plentiful prey. Feed primarily on fish, but will also eat waterfowl and carrion. On the Detroit RD, they currently nest at Detroit Reservoir and Marion lake. Foraging has been documented on most large lakes and streams on the RD.
Least Bittern <i>Ixobrychus exilis</i>	Freshwater or brackish marshes with tall vegetation. Stalks through the weeds to find prey. Eats small fish, frogs, insects, small mammals, and sometimes bird eggs and chicks. Nests are small platform of sticks and live or dead vegetation, placed in cattails, bulrushes, or bushes 8-14" above water. No habitat or sightings have been recorded on the Detroit RD.
Bufflehead <i>Bucephala albeola</i>	Summers on wooded lakes and rivers, winters on lakes and coastal waters. Nesting normally occurs near lakes in tree cavities 5-50 feet high. Dives underwater and eats small mollusks, fish, snail, and crustaceans. Also eats aquatic insects. Winter sightings common at Big Cliff and Detroit reservoirs and numerous sightings occur during spring migration on seasonal lakes.
Harlequin Duck <i>Histrionicus histrionicus</i>	During nesting (April-June) adults require fast-flowing water with midstream loafing sites nearby, dense shrub or timber/shrub mosaic vegetation on the bank, and an absence of human disturbance. Nest on ground under the shelter of vegetation, rocks, or large woody debris in close proximity to water. Broods prefer low gradient streams with adequate macroinvertebrate abundance. Breeding and foraging known to occur along the Little North Fork of the Santiam River, North Fork of the Santiam River, Breitenbush river, Marion Creek, Devils Creek and Blowout Creek on the Detroit RD.
American Peregrine Falcon <i>Falcon peregrinus anatum</i>	Preferred nesting sites are sheer cliffs 75 ft. or more in height having horizontal ledges or small caves. Foraging is associated with a variety of open and forested habitats, however is most closely associated with riparian settings. Numerous potential nest sites occur on the Detroit RD with no recorded sightings of individual which would indicate occupancy of potential habitat.
Yellow Rail <i>Coturnicops noveboracensis</i>	Feeds in shallow water, eating snails, insects, and some seeds and grasses. Summers on wet meadows, marshes; winters on grasslands, fields, and coastal marshes. No documented habitat or sightings of individuals have occurred on the Detroit RD.
Black Swift <i>Cypseloides niger</i>	Found near wet cliffs in mountainous regions. Feeds on-the-wing eating flying insects. Nests in small colonies on ledges or mountain crevices associated with waterfalls. There are historical summer records in the Santiam Pass area, Linn County, which suggests breeding in that area. No sightings have been recorded on the Detroit RD.

Species	Habitat
Baird's Shrew <i>Sorex bairdii permiliensis</i>	Poorly understood and habitat preferences are not known. In 1986 two specimens were trapped from an open Douglas-fir forested area with numerous rotting logs in Polk Co. (Land Mammals of Oregon). It has also been trapped on McKenzie River RD in the Mill Creek area and in the Blue River watershed. No known documented locations on Detroit RD.
Pacific Shrew <i>Sorex pacificus cascadenis</i>	Poorly understood, but considered a riparian associate generally found in moist areas along class III-IV streams with abundant vegetation and down material. Occasionally found in adjacent conifer forest with moist abundant decaying logs and brush. Nests made of grasses, mosses, lichens, or leaves. Feed on slugs, snails, insects, and sometimes vegetation. No documented known locations on Detroit RD.
Pacific Fisher <i>Martes pennanti</i>	Considered a riparian associate but found in a wide variety of densely forested habitats at low to mid-elevations. Diet consists of small and medium-sized forest mammals (porcupines, snowshoe hares, tree squirrels, mice, and voles most common). Also eat carrion, and will seasonally eat birds, bird eggs, amphibians, fish, and insects. Use ground burrows, tree cavities, witches brooms or other clumped growth, or occasionally bird or small mammal nests as resting sites. Tree cavities are used by most maternal females with young and ground burrows are used mostly in winter. Data suggests they do better in areas with minimized fragmentation of old growth, second-growth, and riparian area and in areas with abundant down and standing woody material important. No sightings of fishers have been recorded on the Detroit RD.
California Wolverine <i>Gulo gulo</i>	Found primarily in wilderness or remote country where human activity is limited. High elevation areas appear to be preferred in summer, which may effectively separate wolverines and intensive human disturbance in most areas. In winter wolverines may move to lower elevations that are snowbound and/or have very limited human activity. They are capable of foraging widely (30-40 km) on a daily basis, and do not significantly use young, dense stands of timber or clearcuts. The majority of activity occurs in large expanses of scattered mature timber, with some use of ecotonal areas such as small timber pockets, and rocky, broken areas of timbered benches. Heavy use of openings w/ good winter populations of big game, a principal source of carrion which makes up much of the wolverine's diet. They also feed on marmots, snowshoe hares, various rodents, insects, insect larvae, eggs, and berries. Historical sightings on the Detroit RD have occurred over a wide range of habitat types and locations. Sightings have not been reported in approximately 15 years.
Pacific Fringe-tailed Bat <i>Myotis thysanodes vespertinus</i>	Occurs in Oregon, however habitat use is poorly documented. Three captured in 1971 were associated with young coniferous forest. They are known to use caves, mines, rock crevices, and buildings as both day and night roosts. Nothing is known about habits in winter. Diet of moths, leafhoppers, lacewings, daddy-longlegs, crickets, flies, true bugs, and spiders. Occurrence has not been documented on Detroit RD.
Oregon Slender Salamander <i>Batrachoseps wrighti</i>	Live in forested areas, especially old-growth Douglas-fir and younger stands with abundant downed large logs. They lay their eggs under thick bark, inside a crevice in a log, or in talus. Juveniles and adults live under thick bark, inside partially decayed logs, or in debris piles around the bases of large snags. They also occur in moist talus w/ abundant woody debris. Sightings have been documented on the Detroit RD at numerous sites and habitat types.
Cascade Torrent Salamander <i>Rhyacotriton cascadae</i>	Live in very cold, clear springs, seeps, headwater streams, and waterfall splash zones. Forage in moist forests adjacent to these areas. Eggs are laid in rock crevices in seeps. Larve and adults live in gravel or under small cobbles in silt-free, very shallow water that is flowing or seeping. Adults may be found under debris on streambanks or in streamside forests and talus during rainy periods. Sightings have been documented on the Detroit RD.

Species	Habitat
Foothill Yellow-legged Frog <i>Rana boylei</i>	Live in sections of low-gradient streams with exposed bedrock or rock and gravel substrates. Attach eggs to the bottom of quiet scour-pools or riffles in gentle-gradient streams, often where there is only slight flow from the main river. Hatchlings cling to egg masses initially and then to rocks. Nearest known sightings are on private lands adjacent to the Sweet Home RD to the north. Individuals have not been recorded on the Detroit RD and suitable habitat is not present.
Oregon Spotted Frog <i>Rana pretiosa</i>	Favor lakes and slow moving streams associated w/a permanent water source w/ a soft and muddy bottom. A marsh specialist w/strong preference/requirement for warmer waters; more aquatic than other ranids; often found in water or water's edge floating on the surface or resting on aquatic vegetation. Diet is invertebrates caught above and below the surface. Early breeders: egg masses are typically deposited on top of one another in a communal fashion, not attached to vegetation, and deposited in warmer shallow water, making them susceptible to mortality due to freezing or drying. Individuals have not been recorded on the Detroit Rd.
Northwestern Pond Turtle <i>Clemmys marmorata marmorata</i>	Inhabit marshes, sloughs, moderately deep ponds, slow moving portions of creeks and rivers. Observed in altered habitats including reservoirs, abandoned gravel pits, stock ponds, and sewage treatment plants. Occur from sea level to about 1,830 meters. Require basking sites, such as partially submerged logs, vegetation mats, rocks and mud banks, and may even climb a short way onto tree branches that dip into the water. They use uplands for egg laying, overwintering, and dispersal. They may move up to 500 meters and possibly more for overwintering where they burrow into leaf litter or soil. Nest distances from the water course ranges from 3 meters to over 402 meters. Sparse vegetation, usually short grasses or forbs characterize most nesting areas. Individuals have not been recorded on the Detroit RD and suitable habitat is not present
Mardon Skipper <i>Polites mardon</i>	A small, tawny-orange butterfly currently known to exist at seven, small, geographically disjunct areas in Washington, Oregon, and California. In the southern Washington Cascades, the mardon skipper is found in open, fescue grasslands within Ponderosa pine savanna/woodland habitat at elevations ranging from 1900' to 5100'. South Cascade sites vary in size from small, ½ acre or less meadows, to large grassland complexes, and site conditions range from dry, open ridgetops, to areas associated with wetlands or riparian habitats. Within these environments a variety of nectar source plants are important. The short, open stature of native fescue bunchgrass stands allows mardon skippers to access nectar and oviposition plants. There are no documented reports of this species on the Willamette NF.
Crater Lake Tightcoil <i>Pristiloma arcticum crateris</i>	Species may be found sparsely distributed throughout Oregon Cascades above 2000' elevation associated with perennially wet environment in mature conifer forests and meadows among vegetation or under rocks and woody debris. Suitable locations within 10 meters of open water generally in areas under snow for extended periods during winter. One documented site on Middle Fork RD along with a few sites on Mt Hood, Deschutes, Umpqua, Winema, and Rogue River National Forests. No individual have been documented on the Detroit RD.

Species dropped from further analysis

Marsh habitat suitable for the regionally sensitive *Yellow Rail* and *Least Bittern* are not present on the Detroit Ranger District. Potential cliff nesting habitat for the *American Peregrine Falcon* occurs more than 3 miles from proposed project units so is beyond the area which would be considered foraging habitat if the habitat was occupied. Wet cliff habitat suitable for *Black Swift* nesting is not found in or adjacent to proposed harvest units. Large streams or rivers suitable for *Harlequin Duck* nesting or foraging habitat is not found in or adjacent to project units. Low gradient streams with exposed bedrock suitable for *Foothill Yellow-legged Frog* habitat is not found on the Detroit Ranger District. Slow moving water with other habitat components needed by *Northwestern Pond Turtles* are not located on the Detroit Ranger District. Slow moving streams or lakes warm enough to support *Oregon Spotted Frogs* are not located in or adjacent to proposed units. Habitat with fescue grass suitable for *Mardon Skipper* habitat was not located in or adjacent to the proposed units.

The no action alternative which proposed no new activities will have no effects to Threatened, Endangered, Proposed or Sensitive (TEPS) animal species. Only potential effects of the Action Alternatives will be discussed further in this document.

Table 2. Species dropped from consideration based on lack of habitat

Species	Step #1 Pre-field Review	Step #2 Field Recon.	Step #3 Conflict Determination	Step #4 Analysis of Significance	Step #6 FWS Review
Birds					
American Peregrine Falcon	Habitat not present	Not Conducted	None	No impact	
Black Swift	Habitat not present	Not Conducted	None	No impact	
Harlequin Duck	Habitat not present	Not Conducted	None	No impact	
Least Bittern	Habitat not present	Not Conducted	None	No impact	
Yellow rail	Habitat not present	Not Conducted	None	No impact	
Herpetiles					
Cascade Torrent Salamander	Habitat not present	Not Conducted	None	No impact	
Foothill Yellow-legged Frog	Habitat not present	Not Conducted	None	No impact	
Northwestern Pond Turtle	Habitat not present	Not Conducted	None	No impact	
Oregon Spotted Frog	Habitat not present	Not Conducted	None	No impact	
Insects					
Mardon Skipper	Habitat not present	Not Conducted	None	No impact	

Evaluated Species Survey Information, Environmental Baseline for Species Evaluated, Effects of the Proposed Management Action on Species Evaluated, and Effects Determination

Analysis of habitat and effects to Threatened, Endangered and Sensitive species are summarized in Table 3. Analysis of impacts was done based on the process established in Section 2670 of the Forest Service Handbook and the R-6 Interim Direction R-6 2670-92-1. In addition to these and the following documents, personal knowledge of the area, professional judgment, and other studies were used to assess the risk of the proposed project adversely affecting a Threatened, Endangered, or Sensitive Species.

Table 3. Action Alternatives:

Regionally Sensitive Species	Step #1 Pre-field Review	Step #2 Field Recon.	Step #3 Conflict Determination	Step #4 Analysis of Significance	Step #6 FWS Review
Birds					
Bufflehead	Habitat present	Not Conducted	None	No impact	
Mammals					
Baird's Shrew	Habitat present	Not Conducted	Yes	May impact	
California Wolverine	Habitat present	Not Conducted	None	No impact	
Pacific Fisher	Habitat present	Not Conducted	None	No impact	
Pacific Fringe-tailed Bat	Habitat present	Not Conducted	Yes	May impact	
Pacific Shrew	Habitat present	Not Conducted	Yes	May impact	
Herpetiles					
Cascade Torrent Salamander	Habitat present	Not Conducted	None	No impact	
Oregon Slender Salamander	Habitat present	Not Conducted	Yes	May impact	
Mollusks					
Crater Lake Tight coil snail	Habitat present	Not Conducted	None	No impact	

Threatened Endangered and Proposed Species	Step #1 Pre-field Review	Step #2 Field Recon.	Step #3 Conflict Determination	Step #4 Analysis of Significance	Step #6 FWS Review
Birds					
Northern Bald Eagle	Habitat present	Not Conducted	None	No effect	
Northern Spotted Owl	Habitat present	Not Conducted	Potential	No effect	Yes

Effects of Action Alternatives on Species Considered in More Detail

Birds

1. Bufflehead (*Bucephala albeola*)

Status: Federal: R6: Sensitive

State: undetermined status, breeding population

Habitat and Pre-field Review: Buffleheads forage in lake and pond environments and nest in tree cavities along the shore. Winter sightings are common at Big Cliff and Detroit reservoirs and numerous sightings occur during spring migration on seasonal lakes. Nesting is possible in high cascade lakes but is rare. The last recorded nesting occurrence on Detroit RD was at Red Butte Lake in 1946 (Birds of Oregon) which is approximately five miles east of the project area. There are numerous lakes East and South of the project area which could be used for Bufflehead nesting. Buffleheads nest in tree cavities and nest boxes. Natural snags are now abundant adjacent to lakes in the wilderness area as a result of forest fires. Surveys have not been conducted for this species on the Detroit RD although they have been incidentally observed during the fall, winter and spring seasons. Summer surveys at high Cascade lakes where they are suspected to nest have not been conducted on the district. Lake and pond habitat is found near the project area. The closest lake to proposed project units is Pine Ridge Lake which is 0.1 miles east of shelterwood removal unit 18. Unit 18 does not contain suitable nesting habitat and it is not visible from the lake.

Field Reconnaissance: Pine Ridge lake is located adjacent to the project area and is within a special use area for a Boy scout camp. For safety reasons snags with defect have been removed in the area surrounding Pine Ridge lake. The lack of snags with cavities reduces the probability that buffleheads would nest in the area. During non-project related visits to Pine Ridge lake in previous years buffleheads were not observed using the lake during the breeding season. Surveys to determine summer occupancy by buffleheads have not been conducted on the Detroit Ranger District or within the project area.

Analysis of Effects

Alternatives 1 & 3:

Direct and Indirect Effects: Alternative 1 & 3 do not have proposed units which contain or are adjacent to suitable habitat for buffleheads. No impacts to buffleheads will occur from these alternative.

Cumulative Effects: These alternatives will not create additional cumulative effects to buffleheads in the planning area. Pine Ridge Lake has a boy scout facility including boating docks, a large kitchen/meeting building and out buildings. Occupancy during the summer by boy scouts and the associated disturbance occur seasonally. These activities are expected to discourage buffleheads from foraging in the lake. Past, present and reasonable foreseeable forest

management activities associated with the boy scout camp have made and will maintain forest habitat unsuitable for nesting.

Determination: Because no nesting habitat will be affected by the proposed activities, nesting habitat has been removed adjacent to the lake and disturbance is not expected to occur from project activities, it is my determination that all action alternatives will have no impact on buffleheads.

Recommendations: None.

Alternatives 2 & 4:

Direct and Indirect Effects: The only proposed activities near bufflehead foraging habitat is 19 acres of shelterwood removal in unit 18. Because this unit is at least 0.1 miles from Pine Ridge lake and not in direct line-of-sight of the lake, it is not expected to have any effect on use of Pine Ridge Lake by buffleheads. Nesting habitat does not occur in unit 18.

Cumulative Effects: Based on the lack of nesting habitat and distance of unit 18 from Pine Ridge Lake no additional cumulative effects are expected to occur from these alternatives. Pine Ridge Lake has a boy scout facility including boating docks, a large kitchen/meeting building and out buildings. Occupancy during the summer by boy scouts and the associated disturbance occur seasonally. These activities are expected discourage buffleheads from foraging in the lake. Past, present and reasonable foreseeable forest management activities associated with the boy scout camp have made and will maintain the habitat unsuitable for nesting.

Determination: Because no nesting habitat will be affected by the proposed activities, nesting habitat has been removed adjacent to the lake and disturbance is not expected to occur from project activities, it is my determination that all action alternatives will have no impact on buffleheads.

Recommendations: None.

2. Northern bald eagle (*Haliaeetus leucocephalus*)

Status: Federal: Threatened

State: Threatened

Indicator species for endangered species habitat

Habitat: Bald eagles require habitat consisting of scattered old-growth conifer trees near available fish sources. Bald eagles forage widely during non-nesting season, and scavenge on carcasses such as deer and elk.

Statewide bald eagle populations are increasing and new nesting sites are discovered yearly. As populations increase statewide it is reasonable to expect additional nest sites to become established on the Detroit Ranger District. Nesting habitat is available in areas of the district where foraging habitat is available such as the Breitenbush River, North Santiam River and Little North Fork of the Santiam River.

The Detroit Ranger District has two known nesting pairs of bald eagles. One nesting pair is located at Detroit Reservoir and a second at Marion Lake. Marion Lake is approximately 3 miles east of the Presley's Twin project. Foraging habitat occurs at numerous lakes in the wilderness to the east of the planning area and along the Santiam River which follows the western edge of the planning area.

References used to aid in analysis were the Pacific States Bald Eagle Recovery Plan, USFWS, 1984 and the Land and Resource Management Plan, Willamette National Forest, as amended, 1990.

Pre-field review: Bald eagles have been observed foraging at Pine Ridge Lake in the planning area. Foraging is most common during occupancy of the area by boy scouts in the summer. The eagles forage on injured catch and release fish which are stocked in the lake by the boy scouts. Eagles have been observed foraging while extensive use of the lake and surrounding area by boy scouts is occurring. Harvest activities are not expected to disturb foraging bald eagles as units are not adjacent to the lake.

Foraging habitat is not located in or adjacent to proposed harvest units so nesting is not expected to occur there. As nesting is not expected to occur in proposed Presley's Twin harvest units Bald Eagle surveys were not conducted for this project.

Field reconnaissance: Not conducted as part of the Presley's Twin analysis. Field reconnaissance of the Pine Ridge Lake area was conducted by the author as part of a hazard tree removal project in approximately 2003.

Analysis of effects

All Action Alternatives:

Direct and indirect effects: Bald eagles observed using the lake are suspected to be from a pair nesting at Marion Lake to the east of the project area. No effects are expected to occur from disturbance as eagles use this area for foraging during high use periods by humans. Potential nesting habitat is not being altered by the project.

Cumulative effects: There are no effects associated with past, present, and reasonably foreseeable activities in the project area that when added to the effects of the proposed action are expected to result in cumulative effects. Nesting habitat adjacent to foraging habitat is not being removed by the Presley's Twin project or other activities in the area. Human use of the boy scout camp is expected to remain stable.

Determination: Because no lakeside habitat will be affected by the proposed activities and the sale activities will not increase disturbances to eagle foraging use on Pine Ridge Lake, it is my determination that all action alternatives will have no effect on bald eagles.

Recommendations: None.

Communications with U.S. Fish and Wildlife Service: Interagency cooperation between the Forest Service (or other federal agency) and the U.S. Fish and Wildlife Service, regarding proposed, threatened or endangered species, is described in Section 7 of the Endangered Species Act. Definitions relating to "consultation" and "conferencing" are given in the FSM Supplement 2600-90-6.

Communication with USFWS is not needed for each listed species and is not needed for sensitive species. Need for further consultation with the U.S. Fish and Wildlife Service is based on the projects affects on T&E individuals or their habitat. Based on this analysis of the Presley's Twin project, it is my determination that all action alternatives will have no effects on Bald Eagles. With no effects to Bald Eagles or their habitat there is no requirement to consult with USFWS concerning the Presley's Twin project.

3. Northern spotted owl (*Strix occidentalis caurina*)

Status: Federal: Threatened

State: Threatened

Indicator species for Old-growth and mature coniferous forests.

Habitat and Pre-field review: The northern spotted owl is primarily an inhabitant of old growth and mature forests. Suitable spotted owl habitat contains adequate quantities of dead and down woody material, decadent trees, a medium to high crown closure, multiple layers in the overstory, and trees at least 200 years old or greater than 32 inches dbh (ISC Report 1990). However, all of the above characteristics do not need to be present for spotted owls to be present or for spotted owls to make use of an area, and for habitat to be determined suitable.

Prior to harvest in the analysis planning area, including wilderness, there are 12,713 acres of suitable spotted owl habitat (nesting and foraging) and 15,100 of dispersal habitat. Total forested and non-forested acres in the planning area are 53,031. Large areas of the planning area are in the Mt. Jefferson wilderness. The wilderness has had two wildfires in the past 5 years which burned mostly non-owl habitat and dispersal habitat. Much of the wilderness forest is mountain hemlock which seldom reaches diameters large enough to provide dispersal habitat and never reach suitable habitat size.

In the analysis area there are ten known spotted owl activity centers. Six of the ten spotted owl activity centers are surrounded by established 100-acre late successional reserves. One of the ten activity centers is in the Mt. Jefferson Wilderness and is surrounded by a 100-acre late successional reserve.

Challenges to spotted owl conservation exist range-wide, which includes potential threats from wildfires, barred owl competition, great horned owl predation, West Nile Virus and sudden oak death. Disturbances on the landscape from wildfires and wind storms have affected spotted owl habitat.

Loss and fragmentation of suitable spotted owl habitat and other interior forest species habitat in the planning area have had detrimental effects on these species. Fragmented habitat increases flight distance and energy consumption for foraging, and increases habitat suitability for predatory and competitive owls such as the great horned and barred owls. This fragmentation may increase spotted owl mortality, especially for juveniles.

Suitable spotted owl habitat has been defined in various documents: The ISC Report, USFWS Critical Habitat Determination, Memorandum Decision and Injunction for Judge Dwyer's Decision, and the FSEIS on Management of the Northern Spotted Owl in the National Forests. General guidelines for suitable spotted owl habitat are forested stands of Douglas-fir, Western hemlock, Western red cedar, or Ponderosa pine older than 200 years and having a moderate to thigh canopy closure of 60-80%. An understory of multi-layered conifers and hardwoods open enough to still allow owls to fly within and beneath it, moderate to thigh snag densities, and large logs are also found in typical spotted owl habitat. However, all of the above characteristics do not need to be present for spotted owls to make use of an area, and for habitat to be determined suitable.

Dispersal habitat typically would not have the large, old-growth nest trees, multi-layered canopy, or many large snags and logs. The minimum canopy closure for dispersal habitat is 40% and minimum diameter 11" dbh.

Critical habitat is designated by the USFWS to identify lands that are considered essential for the conservation and recovery of listed species. Critical habitat unit (CHU) OR-15, for spotted owls, is located along the southern boundary of the project area. To avoid effects to critical habitat the part of proposed unit 30, which was in the CHU, was dropped from the proposed project.

The Santiam Area of Concern (AOC) was identified by the Willamette National Forest as an area in which dispersal habitat is unable to fully facilitate dispersal requirements for Northern Spotted Owls. In the AOC dispersal is a concern for the next 30 years while current early successional forest achieve dispersal conditions. The AOC overlaps the western portion of the proposed project. Dispersal corridors are limited in the project area due to past harvesting. This limitation is especially noticeable in the North/South direction. Additional reduction in dispersal habitat occurred east of the project area in the B&B and Puzzle fire areas. These combined effects made it apparent that the value of remaining corridors in the project area are significant for spotted owl dispersal. A North/South no harvest corridor was developed through the proposed project area, units or portions of units proposed in this corridor were dropped from consideration, to maintain connectivity of dispersal habitat in the area.

A measure of dispersal habitat effectiveness for the Santiam Area of concern is based on the amount of dispersal habitat in a quarter township. Suitable spotted owl habitat and dispersal habitat both function as dispersal habitat. This measure targets 50% or more of the area in dispersal habitat condition to be considered effective dispersal habitat. The analysis area has 4 quarter townships which each meet this target level. Current levels are as follows – T11S R7E SW ¼ – 54.9%, T11S R7E SE ¼ - 58.4%, T12S R7E NW ¼ - 59.7%, T12S R7E NE ¼ – 80.9%.

The U.S. Fish and Wildlife Service has determined that reduction of suitable spotted owl habitat below 40% of the median home range (1,182 acres) has notably higher likelihood of leading to disruption of essential breeding, feeding and sheltering behaviors (USDI Fish and Wildlife Service, 1992). A 1.2 mile radius around the activity centers defines the median home range. Ten known Spotted Owl activity centers including six within 100 acre LSR's are located in the analysis area. Five of these activity centers are within 1.2 miles of project units including two within 100 acre LSR's. Of the five known activity centers three are resident single birds and two are night time responses from pairs.

The proposed project units occur in habitat suitable for spotted owl foraging, dispersal and non-habitat. Nesting habitat is not present in the proposed project units.

Guiding documents for Spotted Owl analysis include: Land and Resource Management Plan, Willamette National Forest, as amended, 1990; Record of Decision, for amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, U.S. Department Of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, April 13, 1994; Biological opinion 1-7-06-I-0192 for NLAA Habitat Modification activities, Willamette Planning Province.

Design criteria common to all action Alternatives

The following requirements comply with terms and conditions as stated in Biological Opinion 1-7-06-F-0179 for activities that have the potential to adversely affect northern spotted owls, due to habitat modification and disturbance.

The hauling and removal of hazard trees for public safety are not seasonally restricted. Otherwise, project related activities involving chainsaws are prohibited within 65 yards of known spotted owl activity centers from March 1 – July 15. Heavy equipment use is prohibited within 35 yards of spotted owl activity centers during that time. Post-harvest burning is prohibited within 0.25 miles of known activity centers from March 1 – July 15. However, post-harvest prescribed burning may take place during the critical breeding period if the unit falls within .25 miles of unsurveyed suitable habitat when no activity center is present. These restrictions do not apply to known activity centers or other suitable habitat that are surveyed to protocol and found to be unoccupied or have no nesting activity.

Chainsaw and heavy equipment use is not restricted within any proposed harvest units. The location of known activity centers are isolated from road systems and harvest units and no proposed activities will occur within the 65 yard disruption distance. Consult the district wildlife biologist prior to initiating any activities not described above or in the proposed action, such as whistles on yarding equipment and activities outside harvest units, which produce noise above ambient levels and may disrupt spotted owl nesting.

Field reconnaissance: Surveys in parts of the area where units are proposed were conducted in 1991, 1993, 1995 & 1996. No surveys were conducted as part of the Presley's Twin analysis.

Analysis of effects

Alternative 2 – Commercial Thinning and Shelterwood Removal

Direct and indirect effects:

Effects of Habitat Modification

On matrix land 22 acres of foraging habitat will be removed, 72 acres of foraging habitat will be thinned and remain foraging habitat, 262 acres of spotted owl dispersal habitat will be removed, 576 acres of spotted owl dispersal habitat will be thinned and remain dispersal habitat (degraded), and 588 acres of habitat not suitable for spotted owl dispersal will be removed. Post and pole sales will occur on 40 acres of spotted owl dispersal habitat which will remain dispersal habitat after harvest (degraded) and on 106 acres of habitat not suitable for spotted owl dispersal.

Units which are partly or wholly within the Santiam Area Of Concern (AOC) are 1, 2, 4, 9-16, 20, 21, 23-30, 41-43, 50, 55, 56, 59, 60, 62, 63, 161, 411, 491 & 561. Units within the AOC will be silviculturally treated as follows: 8 acres of suitable spotted owl foraging habitat will be removed, 24 acres of suitable spotted owl foraging habitat will be thinned (degraded), 302 acres of spotted owl dispersal habitat will be thinned (degraded), 109 acres of spotted owl dispersal habitat will be removed, 437 acres of habitat unsuitable for spotted owl dispersal will be removed and 3 acres of habitat unsuitable for spotted owl dispersal will be thinned.

In the Santiam Area of Concern all quarter townships will maintain dispersal habitat above the 50% minimum level. Reductions in dispersal habitat are as follows: T11S, R7E SW 54.9% to 54.0%, T11S R7E SE 58.4% to 57.8%, T12S, R7E NW 59.7% to 59.4% and T12S R7E, NE 80.9% to 77.1%. Therefore, the Santiam Area of Concern will continue to provide habitat for Spotted Owl dispersal across the project area after the implementation of Alternative 2.

Five spotted owl activity centers are located within 1.2 miles of proposed harvest units. Three of the activity centers are resident single birds and two are night time responses from pairs. Two of the single birds (4478, 4375) will have no habitat alteration within their home ranges. The third single bird (3864) will have three acres of foraging habitat removed and 22 acres of foraging habitat degraded by thinning, which will remain foraging habitat after harvest. One pair (3340) will have 9 acres of foraging habitat removed and 25 acres of foraging habitat degraded by thinning, which will remain foraging habitat after harvest. One pair (3875) will have 28 acres of foraging habitat degraded by thinning, which will remain foraging habitat after harvest. Table 4 lists the above acres removed as a component of home range suitable Spotted Owl habitat.

Forage removal in the home range of master sites 3864 and 3340 is related to shelterwood unit 411 and degrading foraging habitat is related to thinning unit 42. Forage degrading in the home range of master site 3875 is related to thinning units 44, 46 and 47.

Presley's Twin has historic Spotted Owl activity centers that are likely to be harmed. "Affected spotted owl pairs are expected to have very low levels of foraging habitat within their provincial home ranges or core areas to supporting nesting post-treatment. All adverse affects are in non-reserve areas under the NWFP that will continue to support dispersing spotted owls. It was understood that spotted owls nesting would continue to be impacted in non-reserve areas as a trade off of balancing the needs of a species with economics, but that the reserve areas will

support and continue to have in-growth of suitable habitat to provide for the recovery of the spotted owl.” B.O. p.86

Table 4 Owl activity centers within 1.2 mile radius of proposed harvest units

Spotted Owl Master Site Number	Type of Activity Center	Existing Condition Spotted Owl Habitat Acres within 1.2 mile radius home range			Post Harvest Spotted Owl Habitat Acres within 1.2 mile radius home range		
		Nesting	Foraging	Total	Nesting	Foraging	Total
4478	Resident Single	164	1095	1259	164	1095	1259
4375	Resident Single	0	291	291	0	291	291
3864	Resident Single	7	352	359	7	349	349
3340	Nighttime Pair	9	851	860	9	842	851
3875	Nighttime Pair	0	207	207	0	207	207

Table 5 Action descriptions used to clarify effects of the proposed action on spotted owl habitat from USFWS Biological Opinion 1-7-06-F-0179.

Action	Effect to Spotted Owl	Rationale for Effect Determination
Remove suitable habitat – 22 acres of foraging habitat	MA,LAA ¹	Removal of suitable habitat will likely remove occupied spotted owl habitat, and therefore <i>may affect, and are likely to adversely affect</i> spotted owls due to the impairment of breeding and/or feeding. This activity is likely to have a measurable effect on the ability of spotted owls to forage or shelter because suitable habitat will be removed and the stands may not be able to function as spotted owl habitat. Even though some structural components (snags, clumps of large trees, down wood) will be retained to meet existing NWFP requirements, the overall affect to spotted owl habitat is that it will be set back for 30-40 years before it provides stand conditions suitable for owl dispersal and over 80 years before it functions once more as NRF spotted owl habitat. Therefore, the removal of suitable spotted owl habitat may affect the success of spotted owls to raise young, because 1) if a nest tree is removed, the pair will not be able to produce young until a suitable replacement nest has been established, and 2) if foraging habitat is limited near a nest tree, and more foraging habitat is removed the spotted owl pair may not be able to obtain enough food to successfully fledge their young.
Remove dispersal habitat – 262 acres	MA,NLAA ²	This activity is not likely to have a measurable effect on the ability of spotted owls to forage, or shelter while they are dispersing, since this action is only allowed when dispersal habitat is not lacking in the area.

Action	Effect to Spotted Owl	Rationale for Effect Determination
Degrade suitable habitat – 72 acres	MA,NLAA	Degrading of suitable habitat is not likely to have a measurable effect on the ability of spotted owls to breed, forage, or shelter since the stand will retain its ability to function for the breeding, feeding, and roosting of resident spotted owls. The stands will retain a 60 percent or greater canopy cover in addition to some structural components (snags, clumps of large trees, down wood) to meet existing NWFP requirements.
Degrade dispersal habitat – 576 acres	MA,NLAA	This activity is not likely to have a measurable effect on the ability of spotted owls to forage, or shelter while they are dispersing, since this action will only degrade stands, but still function as dispersal habitat. Therefore, the stands will still be able to support dispersing spotted owls.

¹ MA,LAA = may affect, and is likely to adversely affect

² MA,NLAA = may affect, but is not likely to adversely affect

Effects of Disturbance from Habitat Modification Project Activities

The BA for batched consultation, which included this project, did not include any actions which would result in a May Affect and Likely to Adversely Affect determination. All MA-LAA disturbance activities are prohibited in the Presley's Twin project. Only MA-NLAA or NE disturbance activities are planned to occur.

Disturbance from habitat modification projects is evaluated based on distance from suitable habitat and a subset of this is distance from a known activity center which results in nesting disruption potential.

Disturbance is defined in the B.O. and "Consists of the distance from the project boundary outward that would potentially cause a spotted owl, if one was present, to be distracted from its normal activity. This is generally .25 mile from a unit or activity associated with the project and .5 mile for helicopter operations. This type of activity is outside the disruption distance and within the .25 mile disturbance distance and results in a 'may affect, but not likely to adversely affect' spotted owl determination by the USFWS.

Disruption is defined in the B.O. and "Consists of the distance from the project boundary outward that would potentially cause a spotted owl, if one was present, to be distracted from its normal activity to such an extent to significantly impact its normal behavior (harass). The disruption distance is a subset of the disturbance distance." Distances for various activities which result in disruption are listed Table 21 of the B.O.

"The proposed action includes all processes needed to plan, evaluate, survey, prepare and complete activities including, but not limited to, falling, bucking, hauling, post-harvest burning, and firewood sales. Post-harvest prescribed burning may take place during the critical breeding period if the unit falls within 0.25 miles of unsurveyed suitable habitat when no Activity Center is present. If an Activity Center is present within the disruption distance, surveys to protocol may be conducted to determine the breeding status of these spotted owls. If the owls are not

nesting, burning during the critical breeding season may commence. If they are nesting, burning should be delayed until after the critical breeding season.” B.O. p.17

Activities which were not addressed in B.O. 1-7-06-F-0179 are activities within the disruption distance of a known spotted owl activity center during the critical breeding season of March 1 – July 15. Except for hauling and the removal of hazard trees to protect public safety, activities in this category are prohibited unless the activity center is known to be unoccupied or there is no nesting activity as determined by survey to protocol. (It should be noted this is a change from previous prohibitions which relied on disturbance distances relative to unsurveyed suitable habitat).

Table 6, from biological opinion 1-7-06-F-0179. General effects determinations to spotted owls from disturbance associated with habitat modification activities near an active site.

ACTIVITY	DISTANCE FROM ACTIVE NEST SITES			TIME PERIOD
	≤ 65 yards	65 – 440 yards	> 440 yards	
Use of chainsaws	Prohibited	MA-NLAA	NE	March 1 – July 15
	MA-NLAA	MA-NLAA	NE	July 16 – September 30
	NE	NE	NE	October 1 – February 28
Use of heavy equipment	≤ 35 yards	36 – 440 yards	> 440 yards	
	Prohibited	MA-NLAA	NE	March 1 – July 15
	MA-NLAA	MA-NLAA	NE	July 16 – September 30
Prescribed burning	NE	NE	NE	October 1 – February 28
	≤ 440 yards		> 440 yards	
	Prohibited		NE	March 1 – July 15
	MA-NLAA		NE	July 16 – September 30
NE	NE		October 1 – February 28	
Hauling		≤ 440 yards	> 440 yards	
		MA-NLAA	NE	March 1 – September 30
		NE	NE	October 1 – February 29

Cumulative effects: The effects of past management activities on NSO habitat and populations was described in the Habitat and pre-field review section. Ongoing road maintenance is expected to continue to fall hazard trees adjacent to roads which will continue to reduce the quality of suitable spotted owl habitat in the planning area. Personal use firewood cutting is expected to continue near roadways and is expected to maintain reduced amounts of downed wood and thus lower the quality of suitable habitat adjacent to road corridors.

Due to large blocks of suitable habitat located away from road corridors these foreseeable actions in conjunction with the effects of implementing Alternative 2 are not expected to compromise the functionality on any NSO home ranges or create barriers to dispersal across the project area.

Determination: MA-LAA habitat modification will occur by removing 22 acres of foraging habitat. MA-NLAA habitat modification will occur by removing 262 acres of dispersal habitat,

degrading by thinning 72 acres of foraging habitat and degrading by thinning 576 acres of dispersal habitat.

Only MA-NLAA or NE disturbance activities are planned to occur as part of the project. MA-LAA disturbance activities are prohibited.

Communications with the U.S. Fish and Wildlife Service: Interagency cooperation between the Forest Service (or other federal agency) and the U.S. Fish and Wildlife Service, regarding proposed, threatened or endangered species, is described in Section 7 of the Endangered Species Act. Definitions relating to “consultation” and “conferencing” are given in the FSM Supplement 2600-90-6.

Communication with USFWS is not needed for each listed species and is not needed for sensitive species. Need for further consultation with the U.S. Fish and Wildlife Service is based on the projects affects on T&E individuals or their habitat. Based on previous analysis of the predicted effects Presley’s Twin project on spotted owl habitat, it was my determination that formal consultation should occur with USFWS.

Presley’s Twin was submitted to USFWS in July 2006 as part of the “Batched Biological Assessment (BA) for Projects with the Potential to Modify the Habitats of Northern Spotted Owls and/or Bald Eagles or Modify Critical Habitat of the Northern Spotted Owl within the Willamette Province in Fiscal Years 2007-2008”. Biological Opinion 1-7-06-F-0179 was issued in response to the BA submitted in September 2006.

Alternative 3 – Commercial Thin

Direct and indirect effects:

Effects of Habitat Modification

On matrix land 72 acres of foraging habitat will be thinned and remain foraging habitat (degraded), and 576 acres of spotted owl dispersal habitat will be thinned and remain dispersal habitat (degraded). Post and pole sales will occur on 40 acres of spotted owl dispersal habitat which will remain dispersal habitat after harvest (degraded) and on 106 acres of habitat not suitable for spotted owl dispersal.

Units which are partly or wholly within the Santiam Area Of Concern (AOC) are 16, 41-43, 50, 55, 56, 59, 60, 62 & 561. Units within the AOC will be silviculturally treated as follows: 24 acres of suitable spotted owl foraging habitat will be thinned (degraded), 302 acres of spotted owl dispersal habitat will be thinned (degraded) and 3 acres of habitat unsuitable for spotted owl dispersal will be thinned.

In the Santiam Area of Concern all quarter townships will maintain dispersal habitat above the 50% minimum level. No change will occur in dispersal habitat as thinned units will remain dispersal habitat after thinning. Therefore, the Santiam Area of Concern will continue to provide habitat at current levels for Spotted Owl dispersal across the project area after the implementation of Alternative 3.

Five spotted owl activity centers are located within 1.2 miles of proposed harvest units. Three of the activity centers are resident single birds and two are night time responses from pairs. Two of the single birds (4478, 4375) will have no habitat alteration within their home ranges. The third single bird (3864) will have 22 acres of foraging habitat degraded by thinning, which will remain foraging habitat after harvest. One pair (3340) will have 25 acres of foraging habitat degraded by thinning, which will remain foraging habitat after harvest. One pair (3875) will have 28 acres of foraging habitat degraded by thinning, which will remain foraging habitat after harvest. No changes to total suitable habitat acres will occur within the home range of any spotted owl activity centers.

Degrading foraging habitat in the home range of master sites 3864 and 3340 is related to thinning unit 42. Forage degrading in the home range of master site 3875 is related to thinning units 44, 46 and 47.

Table 7 Action descriptions used to clarify effects of the proposed action on spotted owl habitat from USFWS Biological Opinion 1-7-06-F-0179.

Action	Effect to Spotted Owl	Rationale for Effect Determination
Degrade suitable habitat – 72 acres	MA,NLAA	Degrading of suitable habitat is not likely to have a measurable effect on the ability of spotted owls to breed, forage, or shelter since the stand will retain it's ability to function for the breeding, feeding, and roosting of resident spotted owls. The stands will retain a 60 percent or greater canopy cover in addition to some structural components (snags, clumps of large trees, down wood) to meet existing NWFP requirements.
Degrade dispersal habitat – 576 acres	MA,NLAA	This activity is not likely to have a measurable effect on the ability of spotted owls to forage, or shelter while they are dispersing, since this action will only degrade stands, but still function as dispersal habitat. Therefore, the stands will still be able to support dispersing spotted owls.

MA,NLAA = may affect, but is not likely to adversely affect

Effects of Disturbance from Habitat Modification Project Activities

See table 8 below for activities, distances and time periods relating to effects.

The BA for batched consultation, which included this project, did not include any actions which would result in a May Affect and Likely to Adversely Affect determination. All MA-LAA disturbance activities are prohibited in the Presley's Twin project. Only MA-NLAA or NE disturbance activities are planned to occur.

Disturbance from habitat modification projects is evaluated based on distance from suitable habitat and a subset of this is distance from a known activity center which results in nesting disruption potential. See Alternative 2 discussion above for Disturbance and Disruption Definitions.

“The proposed action includes all processes needed to plan, evaluate, survey, prepare and complete activities including, but not limited to, falling, bucking, hauling, post-harvest burning, and firewood sales. Post-harvest prescribed burning may take place during the critical breeding period if the unit falls within 0.25 miles of unsurveyed suitable habitat when no Activity Center is present. If an Activity Center is present within the disruption distance, surveys to protocol may be conducted to determine the breeding status of these spotted owls. If the owls are not nesting, burning during the critical breeding season may commence. If they are nesting, burning should be delayed until after the critical breeding season.” B.O. p.17

Activities which were not addressed in B.O. 1-7-06-F-0179 are activities within the disruption distance of a known spotted owl activity center during the critical breeding season of March 1 – July 15. Except for hauling and the removal of hazard trees to protect public safety, activities in this category are prohibited unless the activity center is known to be unoccupied or there is no nesting activity as determined by survey to protocol. (It should be noted this is a change from previous prohibitions which relied on disturbance distances relative to unsurveyed suitable habitat).

Table 8 from biological opinion 1-7-06-F-0179. General effects determinations to spotted owls from disturbance associated with habitat modification activities near an active site.

ACTIVITY	DISTANCE FROM ACTIVE NEST SITES			TIME PERIOD
	≤ 65 yards	65 – 440 yards	> 440 yards	
Use of chainsaws	Prohibited	MA-NLAA	NE	March 1 – July 15
	MA-NLAA	MA-NLAA	NE	July 16 – September 30
	NE	NE	NE	October 1 – February 28
Use of heavy equipment	≤ 35 yards	36 – 440 yards	> 440 yards	
	Prohibited	MA-NLAA	NE	March 1 – July 15
	MA-NLAA	MA-NLAA	NE	July 16 – September 30
Prescribed burning	NE	NE	NE	October 1 – February 28
	≤ 440 yards		> 440 yards	
	Prohibited		NE	March 1 – July 15
	MA-NLAA		NE	July 16 – September 30
NE	NE		October 1 – February 28	

Hauling		≤ 440 yards	> 440 yards	
		MA-NLAA	NE	March 1 – September 30
		NE	NE	October 1 – February 29

Cumulative effects: The effects of past management activities on NSO habitat and populations was described in the Habitat and pre-field review section. Ongoing road maintenance is expected to continue to fall hazard trees adjacent to roads which will continue to reduce the quality of suitable spotted owl habitat in the planning area. Personal use firewood cutting is expected to continue near roadways and is expected to maintain reduced amounts of downed wood and thus lower the quality of suitable habitat adjacent to road corridors.

Due to large blocks of suitable habitat located away from road corridors these foreseeable actions in conjunction with the effects of implementing Alternative 3 are not expected to compromise the functionality on any NSO home ranges or create barriers to dispersal across the project area.

Determination: MA-NLAA habitat modification will occur by degrading from thinning 72 acres of foraging habitat and 576 acres of dispersal habitat.

Only MA-NLAA or NE disturbance activities are planned to occur as part of the project. MA-LAA disturbance activities are prohibited.

Communications with the U.S. Fish and Wildlife Service: Interagency cooperation between the Forest Service (or other federal agency) and the U.S. Fish and Wildlife Service, regarding proposed, threatened or endangered species, is described in Section 7 of the Endangered Species Act. Definitions relating to “consultation” and “conferencing” are given in the FSM Supplement 2600-90-6.

Communication with USFWS is not needed for each listed species and is not needed for sensitive species. Need for further consultation with the U.S. Fish and Wildlife Service is based on the projects affects on T&E individuals or their habitat. Based on previous analysis of the predicted effects Presley’s Twin project on spotted owl habitat, it was my determination that formal consultation should occur with USFWS.

Presley’s Twin was submitted to USFWS in July 2006 as part of the “Batched Biological Assessment (BA) for Projects with the Potential to Modify the Habitats of Northern Spotted Owls and/or Bald Eagles or Modify Critical Habitat of the Northern Spotted Owl within the Willamette Province in Fiscal Years 2007-2008”. Biological Opinion 1-7-06-F-0179 was issued in response to the BA submitted in September 2006.

Alternative 4 – Shelterwood Removal

Direct and indirect effects:

Effects of Habitat Modification

On matrix land 22 acres of foraging habitat will be removed, 262 acres of spotted owl dispersal habitat will be removed, and 588 acres of habitat not suitable for spotted owl dispersal will be removed.

Units which are partly or wholly within the Santiam Area Of Concern (AOC) are 1, 2, 4, 9-15, 20, 21, 23-30, 63, 161, 411 & 491. Units within the AOC will be silviculturally treated as follows: 8 acres of suitable spotted owl foraging habitat will be removed, 109 acres of spotted owl dispersal habitat will be removed, and 437 acres of habitat unsuitable for spotted owl dispersal will be removed.

In the Santiam Area of Concern all quarter townships will maintain dispersal habitat above the 50% minimum level. Reductions in dispersal habitat are as follows: T11S, R7E SW 54.9% to 54.0%, T11S R7E SE 58.4% to 57.8%, T12S, R7E NW 59.7% to 59.4% and T12S R7E, NE 80.9% to 77.1%. Therefore, the Santiam Area of Concern will continue to provide habitat for Spotted Owl dispersal across the project area after the implementation of Alternative 4.

Five spotted owl activity centers are located within 1.2 miles of proposed harvest units. Three of the activity centers are resident single birds and two are night time responses from pairs. Two of the single birds (4478, 4375) will have no habitat alteration within their home ranges. The third single bird (3864) will have three acres of foraging habitat removed. One pair (3340) will have 9 acres of foraging habitat removed. One pair (3875) will have no habitat alteration within their home range. Table 9 lists the above acres removed as a component of home range suitable Spotted Owl habitat.

Forage removal in the home range of master sites 3864 and 3340 is related to shelterwood unit 411.

Presley's Twin has historic Spotted Owl activity centers that are likely to be harmed. "Affected spotted owl pairs are expected to have very low levels of foraging habitat within their provincial home ranges or core areas to supporting nesting post-treatment. All adverse affects are in non-reserve areas under the NWFP that will continue to support dispersing spotted owls. It was understood that spotted owls nesting would continue to be impacted in non-reserve areas as a trade off of balancing the needs of a species with economics, but that the reserve areas will support and continue to have in-growth of suitable habitat to provide for the recovery of the spotted owl." B.O. p.86

Table 9 Owl activity centers within 1.2 mile radius of proposed harvest units

Spotted Owl Master Site Number	Type of Activity Center	Existing Condition Spotted Owl Habitat Acres within 1.2 mile radius home range			Post Harvest Spotted Owl Habitat Acres within 1.2 mile radius home range		
		Nesting	Foraging	Total	Nesting	Foraging	Total
4478	Resident Single	164	1095	1259	164	1095	1259
4375	Resident Single	0	291	291	0	291	291
3864	Resident Single	7	352	359	7	349	349
3340	Nighttime Pair	9	851	860	9	842	851
3875	Nighttime Pair	0	207	207	0	207	207

Table 10 Action descriptions used to clarify effects of the proposed action on spotted owl habitat from USFWS Biological Opinion 1-7-06-F-0179.

Action	Effect to Spotted Owl	Rationale for Effect Determination
Remove suitable habitat – 22 acres of foraging habitat	MA,LAA ¹	Removal of suitable habitat will likely remove occupied spotted owl habitat, and therefore <i>may affect, and are likely to adversely affect</i> spotted owls due to the impairment of breeding and/or feeding. This activity is likely to have a measurable effect on the ability of spotted owls to forage or shelter because suitable habitat will be removed and the stands may not be able to function as spotted owl habitat. Even though some structural components (snags, clumps of large trees, down wood) will be retained to meet existing NWFP requirements, the overall affect to spotted owl habitat is that it will be set back for 30-40 years before it provides stand conditions suitable for owl dispersal and over 80 years before it functions once more as NRF spotted owl habitat. Therefore, the removal of suitable spotted owl habitat may affect the success of spotted owls to raise young, because 1) if a nest tree is removed, the pair will not be able to produce young until a suitable replacement nest has been established, and 2) if foraging habitat is limited near a nest tree, and more foraging habitat is removed the spotted owl pair may not be able to obtain enough food to successfully fledge their young.
Remove dispersal habitat – 262 acres	MA,NLAA ²	This activity is not likely to have a measurable effect on the ability of spotted owls to forage, or shelter while they are dispersing, since this action is only allowed when dispersal habitat is not lacking in the area.

¹ MA,LAA = may affect, and is likely to adversely affect² MA,NLAA = may affect, but is not likely to adversely affect

Effects of Disturbance from Habitat Modification Project Activities

The BA for batched consultation, which included this project, did not include any actions which would result in a May Affect and Likely to Adversely Affect determination. All MA-LAA disturbance activities are prohibited in the Presley’s Twin project. Only MA-NLAA or NE disturbance activities are planned to occur.

Disturbance from habitat modification projects is evaluated based on distance from suitable habitat and a subset of this is distance from a known activity center which results in nesting disruption potential. See Alternative 2 discussion above for Disturbance and Disruption Definitions.

“The proposed action includes all processes needed to plan, evaluate, survey, prepare and complete activities including, but not limited to, falling, bucking, hauling, post-harvest burning, and firewood sales. Post-harvest prescribed burning may take place during the critical breeding period if the unit falls within 0.25 miles of unsurveyed suitable habitat when no Activity Center is present. If an Activity Center is present within the disruption distance, surveys to protocol may be conducted to determine the breeding status of these spotted owls. If the owls are not nesting, burning during the critical breeding season may commence. If they are nesting, burning should be delayed until after the critical breeding season.” B.O. p.17

Activities which were not addressed in B.O. 1-7-06-F-0179 are activities within the disruption distance of a known spotted owl activity center during the critical breeding season of March 1 – July 15. Except for hauling and the removal of hazard trees to protect public safety, activities in this category are prohibited unless the activity center is known to be unoccupied or there is no nesting activity as determined by survey to protocol. (It should be noted this is a change from previous prohibitions which relied on disturbance distances relative to unsurveyed suitable habitat).

Table 11 from biological opinion 1-7-06-F-0179. General effects determinations to spotted owls from disturbance associated with habitat modification activities near an active site.

ACTIVITY	DISTANCE FROM ACTIVE NEST SITES			TIME PERIOD
	≤ 65 yards	65 – 440 yards	> 440 yards	
Use of chainsaws	Prohibited	MA-NLAA	NE	March 1 – July 15
	MA-NLAA	MA-NLAA	NE	July 16 – September 30
	NE	NE	NE	October 1 – February 28
Use of heavy equipment	≤ 35 yards	36 – 440 yards	> 440 yards	
	Prohibited	MA-NLAA	NE	March 1 – July 15
	MA-NLAA	MA-NLAA	NE	July 16 – September 30
Prescribed burning	NE	NE	NE	October 1 – February 28
	≤ 440 yards		> 440 yards	
	Prohibited		NE	March 1 – July 15
MA-NLAA	NE		July 16 – September 30	
Hauling	NE	NE	NE	October 1 – February 28
		≤ 440 yards	> 440 yards	
		MA-NLAA	NE	March 1 – September 30

		NE	NE	October 1 – February 29
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Cumulative effects: The effects of past management activities on NSO habitat and populations was described in the Habitat and pre-field review section. Ongoing road maintenance is expected to continue to fall hazard trees adjacent to roads which will continue to reduce the quality of suitable spotted owl habitat in the planning area. Personal use firewood cutting is expected to continue near roadways and is expected to maintain reduced amounts of downed wood and thus lower the quality of suitable habitat adjacent to road corridors.

Due to large blocks of suitable habitat located away from road corridors these foreseeable actions in conjunction with the effects of implementing Alternative 4 are not expected to compromise the functionality on any NSO home ranges or create barriers to dispersal across the project area.

Determination: MA-LAA habitat modification will occur by removing 22 acres of foraging habitat. MA-NLAA habitat modification will occur by removing 262 acres of dispersal habitat, degrading by thinning 72 acres of foraging habitat and degrading by thinning 576 acres of dispersal habitat.

Only MA-NLAA or NE disturbance activities are planned to occur as part of the project. MA-LAA disturbance activities are prohibited.

Communications with the U.S. Fish and Wildlife Service: Interagency cooperation between the Forest Service (or other federal agency) and the U.S. Fish and Wildlife Service, regarding proposed, threatened or endangered species, is described in Section 7 of the Endangered Species Act. Definitions relating to “consultation” and “conferencing” are given in the FSM Supplement 2600-90-6.

Communication with USFWS is not needed for each listed species and is not needed for sensitive species. Need for further consultation with the U.S. Fish and Wildlife Service is based on the projects affects on T&E individuals or their habitat. Based on previous analysis of the predicted effects Presley’s Twin project on spotted owl habitat, it was my determination that formal consultation should occur with USFWS.

Presley’s Twin was submitted to USFWS in July 2006 as part of the “Batched Biological Assessment (BA) for Projects with the Potential to Modify the Habitats of Northern Spotted Owls and/or Bald Eagles or Modify Critical Habitat of the Northern Spotted Owl within the Willamette Province in Fiscal Years 2007-2008”. Biological Opinion 1-7-06-F-0179 was issued in response to the BA submitted in September 2006.

MAMMALS

4. Baird's Shrew (*Sorex bairdi permiliensis*)

Status: Federal: R-6: Sensitive
State: None

Habitat and Pre-field Review: Baird's shrew is known to inhabit forested riparian areas in the Cascade mountains. Riparian habitat does exist within the proposed project area. During the planning process riparian areas were buffered and removed from harvest units. In the planning area most riparian areas are intermittent and flow only during snowmelt in the spring. Downing Creek and Meadows Creek have year round flowing water and they have buffers which exclude harvest units from these areas.

Field Reconnaissance: No surveys have been conducted to determine presence of Baird's shrews on the Detroit RD.

Analysis of Effects

All Action Alternatives:

Direct and indirect effects: The proposed project may impact the Baird's shrew or its habitat if they are present and using the forested riparian environment which may be present beyond the buffered stream areas. Riparian areas are narrow adjacent to streams in this area as soils are porous and most water flow is subsurface. Most perennially flowing streams with riparian habitat have no disturbance buffers which protect the habitat and riparian habitat are not expected to extend beyond the stream buffer. As harvest impacts are very small in terms of overall habitat in the planning area, it is my determination that .

Cumulative effects: Riparian habitat is protected by riparian buffers in the planning area. Past activities have had little impact on perennial streams in this area. Most streams are from seasonal runoff and not the type of habitat associated with riparian zones. No other projects are planned which would have an impact on riparian associated habitat in the planning area.

Determination: Because riparian areas are buffered to exclude harvest units and will not be affected by proposed activities effects will be avoided in riparian areas. As Baird's shrew habitat use is not well understood it is expected that individuals using forested habitat may be impacted by harvest activities. The disturbance to individuals is of limited duration and is not expected to exclude Baird's shrews from using the area. Habitat is not expected to be made unsuitable to Baird's shrew use. Based on all action alternatives effecting potential habitat for Baird's shrews, it is my determination that all action alternatives may adversely impact the Baird's shrew or its habitat, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.

Recommendations: None.

5. California Wolverine (*Gulo gulo luteus*)

Status: Federal: Candidate R6: Sensitive
State: Threatened

Habitat and Pre-field Review: Wilderness or remote country where human activity is limited appears essential to the maintenance of viable wolverine populations. High elevation wilderness areas appear to be preferred in summer, which tends to effectively separate wolverines and humans. In winter, wolverines move to lower elevation areas which are snowbound with very limited human activity. Wolverines make little use of young, thick, timber and clear-cuts (Hornocker and Hash, 1981).

Wolverines appear to be extremely wide-ranging, and unaffected by geographic barriers such as mountain ranges, rivers, reservoirs, highways, or valleys. For these reasons, Hornocker and Hash (1981) concluded that wolverine populations should be treated as regional rather than local.

Historical sightings on the Detroit RD have occurred over a wide range of habitat types and locations. Sightings have not been reported in approximately 15 years.

Field reconnaissance: Wolverine surveys have been conducted on the Detroit Ranger District. Cooperative aerial surveys with Oregon Department of Fish & Wildlife were conducted during the winters of 1997-98, 1998-99, 1999-2000 and 2000-2001. Camera bait sets were used to detect carnivores in the winters 2002, 2003 & 2004 with no wolverines detected. Wolverine dens or tracks were not located on the district.

An unusual snow event occurred in the fall of 2003 which allowed vehicle access to snow covered high elevation areas including the Presley's Twin project area. An additional walk in snow tracking survey was conducted in the Marion lake area at this time. No wolverines were detected on the district during these surveys.

Analysis of effects

All Action Alternatives:

Direct and indirect effects: None. Potential foraging may occur through the area as wolverine home ranges usually are between 170 to 270 square miles. Disturbance by equipment is of limited duration and not expected to impact wolverines which may forage through the area.

Cumulative effects: Human use of the adjacent wilderness area can cause disturbance to wolverine occupancy and is expected to cause them to avoid the concentrated use areas around large lakes. Vast areas of the wilderness are unused by humans and provide suitable habitat for wolverines. High human use of the project area during the summer and fall is expected to continue and create conditions unfavorable to wolverine occupancy during this time period. The wilderness is expected to continue to provide suitable habitat for wolverines adjacent to the project area.

Determination: Because the project area has extensive human activities during the summer and fall time periods, which wolverines prefer to avoid, it is unlikely they will occur in this area. If wolverines forage or disperse through active project areas they can easily avoid these areas by using adjacent undisturbed forested habitat. The adjacent wilderness has extensive undisturbed areas which are more likely to be occupied than non-wilderness areas such as the project area. Based on wolverine occupancy of the project area being highly unlikely and project activities being easily avoided by using adjacent forested habitat, it is my determination that all action alternatives will have no impact on California Wolverines.

Recommendations: None.

6. Pacific Fisher (*Martes pennanti*)

Status: Federal: Candidate for listing R-6: none
State: Critical

Habitat and pre-field review: The Pacific fisher is found in a wide variety of forested habitats. Fishers are opportunist feeders and one would find more flying squirrels in their diet than snowshoe hares. Very little is known about fishers in Oregon. Fishers are not known to exist in the project area or on the Detroit ranger district.

Fishers in different regions may have different ecologies (Powell and Zielinski 1994) and, as is true with most field study data, caution should be exercised when extrapolating results from studies conducted in one region to another. However it is commonly suggested in published literature that fisher in the Western states are closely associated with late-successional conifer forests and riparian habitats possessing an interior forest component and abundant structural diversity – particularly for use as denning habitat (Banci 1989, Heinemeyer and Jones 1994, Olson et al. 2001, Powell and Zielinski 1994, Sallabanks et al. 2001). A recent Oregon study (Yaeger 2005) found that structural characteristics may outweigh stand age with respect to selection for use as denning or resting habitat. A spatial and seral mixture of forest habitats may represent the most optimal environment for the species because of its reportedly diverse diet and large home range for an animal its size (range = 7.3mi² - 30.5mi² for adult male).

Overall habitat composition and connectivity, especially comprised of riparian coniferous and mesic forest types, plus security from disturbance for reproductive females may be two key factors to address in considering management of habitat with the welfare of fishers in mind.

Habitat conditions in this area during the reference era favored the likelihood of occupancy by fisher, as it is located well within the historic range for this species and would have been relatively free from human disturbance – especially during the breeding season. Then, as now, population densities would be expected to have been low given our current understanding of fisher ecology.

Maj and Garton (1994) mapped observation records for fisher from 1961 through 1982, which show a cluster of sighting locations in Willamette River watersheds. They also mapped records from 1983 through 1993, which show a sharp decline for sightings in the same location. Occurrence and breeding status data presented by O’Neil et al. (2001) show that fisher both occurs and breeds in Oregon. A review of local records for sightings reported between 1979 and 2005 revealed zero reports of fisher sightings in the Detroit Ranger District. There is no current confirmation that this species occupies habitat in the vicinity of the project, however there is confirmation of fisher presence within the past decade at a location approximately 60 air miles southeast of the planning area on the Umpqua National Forest. Presence was confirmed based on photographic evidence obtained at a remote camera station during a survey conducted by the Oregon Department of Fish and Wildlife.

It has been proposed, and generally accepted that any fishers that may occur in this area are members of one of two genetically isolated populations remaining in Oregon; and also that

any individuals in the southern Cascade Range population are descendants from a reintroduction effort that occurred between 1977 and 1981 (Aubry and Lewis 2003).

Literature suggests fisher are more likely to associate with late seral and old-growth habitat, but may also be expected to occur within younger stands if they contain structural components more commonly associated with older stands. Mature stands and/or stands with 70% canopy closure are located throughout the planning area, and possess sufficient structural diversity such that they are assumed to serve as suitable fisher resting and denning habitat (Yaeger 2005). Potential forage and dispersal habitat is more extensive, and includes much of the remaining forested habitat across the planning area.

Field Reconnaissance: Specific field surveys for fisher have not been conducted within the planning area. Nor has any evidence of the presence of this species been detected as a result of any field reconnaissance or surveys associated with this project throughout the planning process to date.

Carnivore surveys using automated cameras at bait sets were conducted on the Detroit Ranger District during the winters of 2002 & 2003. No fishers were detected at these stations. An unusual snow event occurred in the fall of 2003 which allowed vehicle access to snow covered high elevation areas. Surveys during this unusual event did not locate fisher tracks. A walk in snow tracking survey was conducted in the Marion lake area at this time. No fishers were detected during these surveys.

Analysis of Effects

All Action alternatives:

Direct and indirect effects: Habitat will remain available for fisher use in the project area and adjacent wilderness. Fishers are not known to occur on the Detroit RD so any project disturbance effects are expected to be inconsequential if they occur at all.

Cumulative effects: Wilderness adjacent to the project area has experienced large fires in the last decade which has reduced the amount of habitat available for fishers. Over time these forests are expected to re-grow and begin providing habitat as they mature. Long term expectations are for fire to return to the wilderness and repeat historical stand replacement fire patterns. These occurrences are natural and have maintained the existing ecosystem for centuries. On land outside wilderness habitat suitable for fisher use is expected to increase as current land management practices leave more forest intact after harvest activities. Re-growing forests in previously clearcut areas will begin providing habitat as they mature. Past practices reduced suitable habitat for fishers, current and expected practices are expected to increase habitat over time. The proposed project when combined with other habitat related factors in the area is not expected to add to cumulative effects.

Determination: Based on large areas of undisturbed habitat occurring in the project area and surrounding analysis area being available and disturbance being unlikely, it is my determination that all action alternatives will have no impact on Pacific Fishers.

Recommendations: None.

7. Pacific Fringe-tailed Bat (*Myotis thysanodes vespertinus*)

Status: Federal: R-6: Sensitive
State: Vulnerable

Habitat and Pre-field review: Prefers forested or riparian areas. Nursery colonies have been located in caves, mines and buildings. Project is within the range of the Pacific Fringe-tailed bat. The project is altering habitat which is expected to be used by pacific fringe-tailed bats. Potential habitat for nursery colonies is located within the project boundaries in old growth trees. These trees will be retained in harvest units unless they are determined to be safety hazards. Stands throughout the planning area and adjacent to proposed harvest units contain residual old growth trees which are expected to continue providing roosting and nursery habitat.

Field Reconnaissance: Bat surveys have not been conducted in the planning area.

Analysis of Effects

All Action Alternatives:

Direct and indirect effects: The proposed project may impact the pacific fringe-tailed bat or its habitat. Potential effects may occur if old-growth tree habitat which has potential to be used for nursery colonies are felled as hazard trees during harvest operations. Individual old-growth trees are distributed throughout the project and analysis area and are providing habitat. Any loss of individual old-growth trees in harvest units will have an inconsequential effect on overall habitat availability as suitable trees are located in unharvested adjacent stands.

Cumulative Effects: Previous harvest activities removed old-growth trees which contained defect and cavities which could be used as roosting and nursery habitat by bats. Although this resulted in reduced habitat on the acres contained in harvest units adjacent stands retained old-growth and continued to provide habitat. Current and expected management is expected to retain these old-growth though multiple harvest cycles. In addition, over time green tree retention areas are expected to eventually begin providing trees with old-growth characteristics as they age. The proposed project units will retain most if not all trees with old-growth characteristics. Ongoing hazard tree removal adjacent to roads is expected to continue to reduce trees with defect that could provide habitat to bats. As adjacent areas have suitable habitat for bats the effect of hazard tree removal along roads is inconsequential. The proposed project when combined with past, present and expected future activities will not add cumulative effects to Pacific Fishers or their habitat.

Determination: Suitable habitat for roosting and nurseries is present in and adjacent to project units. Over time this habitat is expected to increase as wildlife trees and trees in green tree retention areas age and develop old-growth characteristics. Old-growth located in proposed harvest units will be retained. Based on suitable roosting and nursery habitat being present in the project and adjacent analysis areas, presently and in the future, suitable habitat is not limited. It is my determination that action alternative three will have no impact on Pacific Fringe-tailed bats. It is my determination that action alternatives two and four of the proposed project may

impact the pacific fringe-tailed bat by removing trees with defect in harvest units that may be safety hazards. Based on potential habitat occurring in some proposed units the all action alternatives may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.

Recommendations: None.

8. Pacific Shrew (*Sorex pacificus cascadenis*)

Status: Federal: R-6: Sensitive
State: None

Habitat and Pre-field review: The Pacific shrew is found in humid forests of western Oregon. Potential habitat does exist in the project area. “Pacific Shrew are often found in moist wooded areas with fallen decaying logs and brushy vegetation.” (Land Mammals of Oregon, p.54-55) The project area is at 4000-4800’ elevation and outside the area considered to be moist western Cascade forest. Snowpack remains later in the season and soils are porous in this area, both factors make the area fairly dry which also results in a lack of brushy vegetation. This does not mean Pacific Shrew’s will not live in this area it is just not the habitat they are most associated with. Although not in or adjacent to the proposed harvest units the edges of the analysis area contain moist wooded areas along the North Santiam River and Marion Creek.

Field Reconnaissance: No surveys have been conducted to determine the presence of Pacific Shrews on the Detroit RD.

Analysis of Effects

All Action Alternatives:

Direct and indirect effects: The proposed project may impact the Pacific shrew or its habitat. The habitat in the planning area is more dry than humid and may not be suitable for Pacific Shrews. This reduces the likelihood that they are using the area and thus reduces the potential for impacts. There is a potential for habitat removal and disturbance of individuals if they are present in the project area. Harvest impacts are expected to be very small if they occur at all.

Cumulative effects: Past management practices involving clear cutting harvest followed by slash burning has reduces decaying wood in these units. Current and expected future harvest treatments will leave much more decaying wood. The exclusion of fire from this area has resulted in a buildup of decaying wood which exceeds levels historically present. When considered together the overall amount of decaying wood is probably higher than historical levels. Forest habitat has not been converted into non-forest habitat so overall the amount of forested habitat is stable. Natural fire cycles in the wilderness to the east of the proposed harvest units continues to occur. Fire suppression has contributed to increased levels of decaying wood on the ground and has increased the potential for the area to burn. In the last decade fires converted thousands of acres of forest into snags and decaying downed wood. These areas will begin re-growing and forests will reestablish themselves as part of this natural cycle. When considered as part of the other activities in the area the proposed project action alternatives are not expected to cause additional negative cumulative effect to Pacific shrews.

Determination: The disturbance to individuals is of limited duration and is not expected to exclude Pacific shrews from using the area. Habitat is not expected to be made unsuitable for Pacific shrews. Based on forested habitat being present and the potential that the habitat can be

occupied, it is my determination that all action alternatives may adversely impact the Pacific shrew or its habitat, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.

Recommendations: None.

HERPETILES

9. Cascade Torrent Salamander (*Rhyacotriton cascadae*)

Status: Federal: R-6: Sensitive
State: Vulnerable

Habitat and Pre-field review: Cascade Torrent Salamanders are expected to be found in streams with flowing cold water and wet areas immediately adjacent to streams. Habitat for Cascade torrent salamanders is not located in proposed units and is located in adjacent areas. The planning area in general has few areas suitable for Cascade Torrent Salamanders as surface streams are infrequent. Most streams in the area are subsurface or seasonal in nature and would not provide suitable habitat. A no harvest corridor was left in the project area to provide for an undisturbed area which connects ecosystems and provides for dispersal of various species through the area. Perennial wet areas are included in this corridor which is adjacent to harvest units. Riparian protection areas also contribute to protection of habitat for Cascade Torrent Salamanders.

Field Reconnaissance: Not conducted for Cascade Torrent Salamanders.

Analysis of Effects

All Action Alternatives:

Direct and indirect effects: Habitat for this species is limited in the planning area and all alternatives will avoid effects to habitat. Perennially wet riparian areas are being buffered by 50 foot avoidance areas and will not be disturbed by proposed harvest units.

Cumulative effects: Riparian areas with flowing cold water and wet areas immediately adjacent to streams have been effected in the past by harvest activities. These areas are expected return to more natural conditions as forests re-grow. Current conditions will remain stable by exclusion of adverse impact from harvest activities. Future conditions will improve over time as a result of riparian area protection. The project will not add adverse cumulative impacts to the area as riparian areas associated with Cascade Torrent Salamanders habitat are protected.

Determination: Based on habitat for Cascade Torrent Salamander habitat not being impacted, it is my determination that all alternatives will have no impact on Cascade Torrent Salamanders.

Recommendations: None.

10. Oregon Slender Salamander (*Batrachoseps wrighti*)
Status: Federal: candidate R-6: Sensitive
State: Undetermined status

Habitat and Pre-field review: Oregon Slender Salamanders are expected to be found under bark and moss in Douglas fir forests, they also use talus and rocky areas as habitat. This type of habitat is found throughout the analysis area and in project units. The proposed project will disturb forested environments which may contain Oregon slender salamanders.

Field Reconnaissance: Surveys were not conducted for the Oregon Slender Salamander in the project area.

Analysis of Effects

All Action Alternatives:

Direct and indirect effects: The proposed project may impact the Oregon Slender Salamander or its habitat. There is potential for habitat removal and disturbance of individuals if they are present in the project area. Bark and other woody debris is expected to be present after harvest and provide habitat for Oregon Slender Salamanders. Some bark and woody debris is expected to be removed by the project with more added after harvest by falling trees for downed woody debris. Impacts to individuals is of short duration and is insignificant in effect as the surrounding unaffected area as well as the project area will continue to provide habitat for this species.

Cumulative effects: The type of habitat used by Oregon Slender Salamanders is readily available across the landscape and other projects and natural events have not significantly altered this habitat. When considered together with other activities in the analysis area this project does not add to other past, present and reasonably foreseeable activities to produce any cumulative effects.

Determination: The disturbance to individuals is of limited duration and is not expected to exclude Oregon Slender Salamanders from using the area. Habitat is not expected to be made unsuitable for Oregon Slender Salamanders. Based on downed wood, bark and moss being disturbed and the potential that the habitat can be occupied, it is my determination that all action alternatives may adversely impact the Pacific shrew or its habitat, but is not likely to result in a loss of viability in the planning area, nor cause a trend to federally listing or a loss of species viability range wide.

Recommendations: None.

MOLLUSKS

11. Crater Lake Tightcoil (*Pristiloma arcticum crateris*)

Status: Federal: R-6: Sensitive
State: None

Habitat and Pre-field review: The Crater Lake Tight coil is a snail that may be found in perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 m. of open water in wetlands, springs, seeps and riparian areas, generally in areas which remain under snow for long periods in the winter. Riparian habitats in the Eastern Oregon Cascades may be limited to the extent of permanent surface moisture, which is often much less than 10 m. from open water. (Pilsbry, 1946). Habitat is present in the project area and is not present in proposed harvest units. Potential habitat for this species is very limited across the landscape and generally falls inside protected habitat types. Potential habitat was located along Downing Creek and this area was integrated into a protected habitat corridor for many species. This undisturbed connecting habitat corridor is excluded from project activities for protection of species present in the corridor and those using it to disperse through the area.

Field Reconnaissance: Riparian areas which may have habitat suitable for *pristiloma* are excluded from harvest units and will not be disturbed by project activities. Surveys were not conducted to determine presence or absence based on habitat not being impacted by the project.

Analysis of Effects:

Action Alternatives:

Direct and indirect Effects: Habitat is not present in proposed units. Areas containing potential habitat, originally considered for project units, were dropped from consideration to avoid possible impacts to Crater Lake Tightcoil snails. As habitat is protected in no disturbance areas there will be no direct or indirect effects to Crater Lake Tightcoil snails from project activities.

Cumulative Effects: No other activities are negatively affecting potential habitat for this species. As no past, present or reasonably foreseeable activities are known to affect habitat for this species no cumulative effects will occur as a result of this project.

Determination: Based on potential habitat being excluded from project activities, it is my determination that all alternatives will have no impact on Crater Lake tightcoil snails.

Recommendations: None.

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Table 12.

REGIONAL FORESTER'S SENSITIVE ANIMAL LIST FOR THE WNF (REVISED 07/2004)

SPECIES	OCCURRENCE ON WNF	OREGON STATE STATUS	FEDERAL STATUS
BIRDS			
<u>Falco peregrinus anatum</u> American peregrine falcon	D	E	S
<u>Cypseloides niger</u> Black Swift	S	P/N	S
<u>Bucephala albeola</u> Bufflehead	D	U	S
<u>Histrionicus histrionicus</u> Harlequin Duck	D	U	S
<u>Haliaeetus leucocephalus</u> Northern Bald Eagle	D	T	T
<u>Strix occidentalis caurina</u> Northern Spotted Owl	D	T	T
MAMMALS			
<u>Sorex bairdi permiliensis</u> Baird's Shrew	D	-	S
<u>Gulo gulo luteus</u> California wolverine	D	T	S
<u>Lynx Canadensis</u> Canada Lynx	D	-	T
<u>Sorex pacificus cascadenis</u> Pacific Shrew	D	-	S
<u>Myotis thysanodes vespertinus</u> Pacific Fringe-tailed Bat	D	V	S
<u>Martes pennanti</u> Pacific Fisher	S	C	S

<u>SPECIES</u>	<u>OCCURRENCE ON WNF</u>	<u>OREGON STATE STATUS</u>	<u>FEDERAL STATUS</u>
INSECTS			
<u>Polites mardon</u> Mardon Skipper	U	-	S
AMPHIBIANS AND REPTILES			
<u>Batrachoseps wrightii</u> D Oregon Slender Salamander	U	U	S
<u>Rhyacotriton cascadae</u> Cascade Torrent Salamander	D	V	S
<u>Rana boylei</u> Foothill Yellow-legged Frog	D	V	S
<u>Rana pretiosa</u> Oregon Spotted Frog	D	C	S
<u>Clemmys marmorata marmorata</u> Northwestern pond turtle	D	C	S

Occurrence on Willamette NF:

S = Suspected

D = Documented

State Sensitive Status: (Oregon Department of Fish and Wildlife, Oregon Natural Heritage Data Base Etc.)C = **Critical.** Listing as threatened or endangered is pending, or for which listing may be appropriate.V = **Vulnerable.** Listing as threatened or endangered is not believed to be imminent or can be avoided through continued or expanded use of adequate protective measures and monitoring.P = **Peripheral.** Those whose Oregon population are on the edge of their range.N = **Naturally rare.** Those species which had low population numbers historically in Oregon because of naturally limiting factors.U = **Undetermined Status.** Species for which status is unclear.**Federal Status:**T = **Threatened**E = **Endangered**S = **Sensitive**P = **Proposed for Listing**C = **Candidate** (Needs further information to confirm the appropriateness of proposing the taxon to the list of Endangered or Threatened species)

Appendix C – Economic Analysis

Economic Analysis Tables

Table 1 – Gross Value

	Alt 2	Alt 3	Alt 4
mbf	18,770	9,450	9,310
selling value	\$542.48	\$519.44	\$573.03
gross value	\$10,182,341	\$4,908,708	\$5,334,909
Associated Costs (from table 5)	\$4,765,310	2,716,487	3,059,224
Appraisal Competition Adjustment	\$610,545	\$287,802	\$275,293
Net Appraised Value	4,879,418	2,589,990	2,476,998
Cost/Benefit Ratio	1.89	1.63	1.60

Table 2 – Logging and Haul Costs

	Alt 2	Alt 3	Alt 4
Tractor Harvest			
mbf	7,546	1,606	6,057
logging cost/mbf	\$99.08	\$102.27	\$94.48
cost total	\$747,658	\$164,246	\$572,265
Mechanized Harvester			
mbf	8,346	7,560	689
logging cost/mbf	\$78.25	\$77.67	\$105.79
cost total	\$653,075	\$587,213	\$72,889
Skyline			
	mbf	509	284
	logging cost/mbf	\$169.29	\$224.25
	cost total	\$86,169	\$63,687
Loader			
mbf	2,369	0	2,369
logging cost/mbf	\$51.98	\$0.00	\$51.98
cost total	\$123,141	\$0	\$123,141
Haul Cost	\$1,033,852	\$528,747	\$494,481
Totals	\$2,643,895	\$1,343,893	\$1,285,991

Table 3 – Road Costs

	Alternative 2	Alternative 3	Alternative 4
Road Maintenance			
mbf	18,770	9,450	9,310
cost/mbf	\$9.90	\$17.69	\$19.98
cost total	\$185,894	\$167,164	\$186,012
Reconstruction	\$836,955	\$286,530	\$827,855
Temp Road Const (included in logging stump to truck cost)	\$10,600	\$8,000	\$0
Open Temp. Roads (“”)	\$16,650	\$6,200	\$11,340
Totals	\$1,022,849	\$453,694	\$1,013,867
Total Volume (mbf)	18,770	9,450	9,310
Total \$/mbf	\$54.49	\$48.01	\$108.90

Table 4 Fuel Treatment Costs*

		Alternative 2	Alternative 3	Alternative 4
Fuel Survey	acres	1,668	636	889
	cost/ac	\$10.00	\$10.00	\$10.00
	cost total	\$16,680	\$6,360	\$8,890
Grapple Pile and Burn	acres	332	291	41
	cost/ac	\$550.00	\$550.00	\$550.00
	cost total	\$182,600	\$160,050	\$22,550
Hand Pile and Burn	acres	42	20	22
	cost/ac	\$1,300.00	\$1,300.00	\$1,300.00
	cost total	\$54,600	\$26,000	\$28,600
Cover Piles	acres	374	311	63
	cost/ac	\$90.00	\$90.00	\$90.00
	cost total	\$33,660	\$27,990	\$5,670
Hand Fireline Construction	miles	0.00	0.00	0.00
Machine Fireline Construction	miles	2.91	2.33	1.55
	cost/mile	\$1,848.00	\$1,848.00	\$1,848.00
	cost total	\$5,390	\$4,305	\$2,870
Underburn	ac	79	79	38
	cost/ac	\$750.00	\$750.00	\$750.00

		Alternative 2	Alternative 3	Alternative 4
	cost total	\$59,250	\$59,250	\$28,500
Burn Landings	ac	60	25	40
	cost/ac	\$150.00	\$150.00	\$150.00
	cost total	\$9,000	\$3,750	\$6,000
Overhead Costs		\$78,606	\$69,265	\$49,506
Totals		\$439,786	\$356,970	\$152,586
Volume	mbf	18,770	9,450	9,310
Total \$/mbf		\$23.44	\$37.77	\$16.38
* Yard Tops Attached is covered in the logging costs				

Table 5 – Associated Costs

	Alternative 3	Alternative 4	Alternative 5
Logging and Haul Costs (table 2)	\$2,643,895	\$1,343,893	\$1,285,991
Road Costs (table 3)	\$1,022,849	\$453,694	\$1,013,867
Fuel Treatment Costs (table 4)	\$439,786	\$356,970	\$152,586
Total Post-sale Activity Costs*	\$658,780	\$561,930	\$606,780

Appendix D – Post-Sale Activities

Post-Sale Activities

The following projects would be funded with KV money if available. The projects have been selected based on a preliminary sale area boundary. If the sale area boundary changes when the contract is prepared, then some of the projects may be eliminated as candidates for KV funding. This list was prioritized at an Interdisciplinary Team meeting on February 14, 2007, at the Detroit Ranger Station.

Priority	Essential Mitigation Opportunity*	KV Activity	Amount	Unit Measure	Unit Cost (\$)	Total cost (\$)	Units	Project Description
1	E	Planting (all units)	169	Ac	650	109,850	all units	
2	M	Subsoiling to reduce compaction	10	Ac	350	3,500	15,23,24,27,29	Mitigation will subsoil 10% of the total acres for these units which is 100 Ac
3	M	Monitor mitigation subsoiling	3	Ac	350	1,050	15,23,24,27,29	Monitor completion of mitigation subsoiling activities
4	M	66' Fuel Treatment 2257, 2261	43	Ac	1,100	47,300	28, 64, 25, 62, 24, 60, 21, 59, 561, 56, 20, 55, 161, 54, 17, 50, 9, 8, 491, 4, 42, 3, 411, 1, 41, 18, 80, 81, 14, 15	Use machine w/vertical shaft rotary head
5	M	Tree Topping	2015	Each	60	120,900	all units	
6	M	DWD Creation	2833	Each	20	56,660	all units	
7	M	Survey/Weed Treatment	15	Ac	200	3,000	1,2,13,14,15,16,17,20	
8	M	Post Sale Monitoring	20	Ac	100	2,000	1,2,13,14,15,16,17,20,23,25,27,28	Monitor project area for weed recruitment 2 years following post-harvest weed treatment
9	M	Visual restoration of landings along 2261 and 2257	29	Site	300	8700	1, 3, 4, 411, 41, 42, 491, 9, 8, 50, 161, 17, 54, 55, 20, 56, 59, 561, 21, 60, 24, 62, 25, 26, 64, 28, 16, 81, 81, 18	chunk material into smaller pieces and haul away, seeding
10	O	Gate Placement	11	Ea	2,100	23,100	1,11,14,15,23,24,27,54, 60,64,81	price per each includes installation
11	O	Berm Placement	3	Ea	500	1,500	5,14,17	
12	O	Meadow protection	2	Ac	2,000	4,000	24	Barriers, signage, inter-planting, monitoring

Priority	Essential Mitigation Opportunity*	KV Activity	Amount	Unit Measure	Unit Cost (\$)	Total cost (\$)	Units	Project Description
		and traffic control off 2257 Rd						
13	O	Wetland Protection	2	Ac	2,500	5,000	49,18	Traffic control, plantings, screening, monitoring
14	O	Meadow protection and traffic control	10	Ac	175	1,750	15,16	Edge control along meadow to enhance tree growth and provide screen to vehicles, monitoring
15	O	Erosion and drainage control along 2257	5	Mi	2,900	14,500	1,3,4,8,9,17,20,21,26,28,42,43,50,54,55,56,59,60,62,63,64,491	After Sale Closure, maintenance drainage structures and road drainage, monitoring
16	O	Danger tree elimination on 2257 and 2261	15	Mi	2,000	30,000	28, 64, 25, 62, 24, 60, 21, 59, 561, 56, 20, 55, 161, 54, 17, 50, 9, 8, 491, 4, 42, 3, 411, 1, 41, 18, 80, 81, 14, 15	level 2,3 roads
17	O	Pre-commercial Thinning	907	Ac	180	163,260	all units	
18	O	Subsoiling to reduce compaction	85	Ac	350	29,750	all units	
19	O	Forage seeding disturbed areas	100	Ac	30	3,000	all units	
20	O	Forage seeding site preparation	20	Ac	200	4,000	all units	
21	O	Educational sign	1	Site	1,500	1,500	18	Near Camp Pioneer
22	O	Revegetation, traffic control near (Camp Pioneer)	40	Ac	650	26,000	18A, 46A, 48A	Ongoing effort to restore the lake shore vegetation at Camp Pioneer, manage hazard trees, monitoring
23	O	Twin Meadows Special	5	Ac	1,000	5,000	14,23	

Priority	Essential Mitigation Opportunity*	KV Activity	Amount	Unit Measure	Unit Cost (\$)	Total cost (\$)	Units	Project Description
		Habitat Maintenance						
24	O	Ceanothus cutback for forage	100	Ac	130	13,000	2,13,14,16,23,60,61,80	
25	O	Dispersed site restoration and traffic control	7	Site	2,000	14,000	2,4,17,42,44,60,491,18	Planting, scarification, signage and barriers, manage hazard trees, monitoring
26	O	Dispersed site restoration and traffic control around Presley's Lake	5	Ac	2,500	12,500	1,40	Inter-planting, signage, drainage work, erosion control, hazard tree management, monitoring
27	O	Fertilization	1036	Ac	120	124,320	all units	
28	O	Firewood Management	1	Sale	5,000	5,000	55, 20, 56, 59, 21, 24, 25, 8, 9, 491, 1	separate firewood from slash burning piles and stack
29	O	widen landing at Pine Ridge Trail	1	Site	10,000	10,000	18	Might require large equipment/excavation
30	O	Rehab old ski trails, fireline, closed roads for Mt. bike trails	12	Mi	1,500	18,000	All Units	water barring, brushing, signing
31	O	Road Maintenance	NA	NA	NA	NA**	Project area	Road resurfacing, and drainage management within the project area

*E= Essential Mitigation, M=Mitigation O=Opportunity

**If project proponents are unable to complete or initiate projects to utilize allocated funding, monies will be spent on road resurfacing and drainage management in the project area.

Appendix E – Aquatic Conservation Strategy Objectives

The objectives surrounding the attainment of the Aquatic Conservation strategy are discussed below. This discussion is relating to the proposed action alternative.

ACSO 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to insure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Under the action alternatives, this project will commercially thin within approximately 220 acres of riparian reserve land allocation. The project will involve less than one percent of the riparian reserves found within the North Santiam River watershed analysis area. This project's focus is; to restore and maintain through time, diversity and complexity of the watershed and the aquatic systems to which species, populations, and communities have adapted. North Santiam River Watershed Analysis (NSWA; FHF. Riparian Reserve Management, page: 82), recommends various management techniques or processes to accomplish long range, (>50 yrs.), landscape level conditions. The proposed project was developed from these recommendations (eg. “...commercial thinning, under-story burning...”)

ACSO 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, Longitudinal, and drainage network connections including floodplains wetlands, up slope areas, headwater tributaries and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Spatial and temporal connectivity within and between watersheds will be maintained through the implementation of Forest Plan riparian reserve widths (NSRWA; FHE Riparian Reserve Widths, page 82). All streams were identified and one standard tree height width, 150 feet, buffer was placed on either side of the channel. These areas allow for connectivity between ridge tops and valley bottoms when ephemeral and perennial stream are considered part of the riparian network. No fish-bearing streams were present.

Treated acres within these riparian reserves will retain an average 60 percent canopy closure after harvest. Chemically and physically unobstructed routes critical to life history requirements will remain intact as a result of this prescription. Spatial connectivity may be restored for some plant and animal species that cannot survive under dense canopy. An increase in insects and arthropods is expected to result from a development of a under story. This prey base increase is expected to benefit animal species.

Proposed removal of material through thinning would be expected to reduce the fuel loading of the site and assist in maintaining connectivity through time. Lower risk of fire would result from this activity (NSRWA;VWG, pg. 85- 86). Excessive amount of slash material would not be generated by this project. Slash accumulations would be treated by lopping, scattering and/or piling dependent on the risk associated to each action. Where this occurs material would

be pulled away from ponds, seeps, or other standing or slow moving water. This would allow for the maintenance of water chemistry of the area.

ACSO 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Physical integrity of the aquatic system is anticipated to be maintained through the utilization of Best Management Practices (BMP's). Specific BMP's utilized for physical integrity are T-2 (Timber Harvest Unit Design); T-7 (Stream side Management Unit Designation); T-8 (Stream course Protection); and T-12 (Suspended Log Yarding in Timber Harvesting). These practices maintain the physical integrity of the aquatic system through designation of parameters in the prescriptions (ie. maintenance of; root strength, shade canopy, and large woody material).

Harvest systems are designed to yard away from all streams in accordance with BMPs T-8 and T-12 (helicopter and other yarding). Decision to remove riparian leave trees may occur with interdisciplinary team consultation on occasion. Material may not meet the long term objectives or pose a health and safety risk to those on the site. Retention of riparian reserve widths (NSRWA; FHE Riparian Reserve Widths, page 82) would maintain channel bank stability. Management within these reserves would further aid long-term stability by reducing fire effects (NSRWA pg. VWG, pg. 85).

ACSO 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the systems and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Water quality parameters of interest for this objective relate to this projects affect on temperature, chemistry and suspended loads. All action alternatives within the riparian reserves are expected with riparian reserve management prescriptions (retention of primary shade and average 60 percent post treatment canopy closure.) to provide adequate shading and maintain stream temperatures within state standards (Compliance with Forest Plan MA-15-06).

Biological, physical, and chemical integrity of water quality will be maintained through utilization of BMP's. Avoiding cutting trees contributing to bank stability, pulling slash away from slow moving water and buffering of live streams during post treatment activities (eg. fertilization), are examples of the recommendation utilized to protect biological, physical, and chemical integrity.

ACSO 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transportation.

The aquatic ecosystems that occur in the proposed harvest units were heavily influenced by fire and early management. The diversity of historic locations of large down wood and large diameter standing trees, (North facing slopes) are the result of isolated pockets fire missed. Sediment input into the stream would be episodic following fire activities. Vegetative slopes have reduced sediment input and reduced effects of peak flows on channel bank erosion, by reducing the snow accumulation typically found on hillsides following fire. The aquatic ecosystems have evolved under this scenario and would be maintained through the maintenance of the riparian reserves.

The episodic pattern of sediment pulses that would of occurred due to the frequency of fire, would retard slightly (10-40 yrs.), due to maintenance of riparian reserves. This would eventually be reestablished when a catastrophic fire occurs. Until such time prudent measures would be taken to reduce the effect of fire through maintenance and management of the components of the riparian reserve (fuel loading; tree density).

ACSO 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

In stream flows are addressed in the Forest Plan for this area (Willamette Land and Resource Management Plan, 1990). Documentation within the watershed analysis limited its discussion to Hydrology of the area and doesn't respond directly to the in-stream flow portions of this question. The Willamette National Forest Plan bridges this limitation through; FW-113; FW-111; FW-093; FW-089. These forest-wide standards and guidelines are required (shall's), in the plan. Upon implementing these Standards it is anticipated that the In stream flows would be maintained and restored sufficiently to create and sustain riparian, aquatic and wetland habitats, and to retain patterns of sediment, nutrient, and wood routing. All alternatives contain the mitigations necessary to insure the attainment of this objective.

ACSO 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

There are minor wetlands in or adjacent to the proposed stands. This projects effect on downstream flood plains or wetlands is negligible due to the prescriptions proposed. The wetlands are associated to the riparian network and will be buffered and protected. No flood plains are found within the project area.

There are several small (less than 1/4 acre) wetlands within the proposed project area. Topography of the area that allows these are associated to colluvial deposits adjacent to stream channels. Short-term impacts may occur to the water-table elevation of these wetlands. These

impacts are anticipated to be negligible due to the increase in transpiration that follows increase stand growth.

ACSO 8: Maintain and restore species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability

A significant issue was raised by the interdisciplinary team concerning connectivity and biodiversity. The cumulative effects of concentrated vegetation treatment in this, and other recent projects, and patterns of disturbance created by recent B&B and Puzzle fires, and highway 22 corridor may affect the connectivity and biodiversity by increasing noise levels, human traffic, invasive species and potentially restricting animal movement.

The placement and density of treatment units led specialists to assess potential negative impacts to wildlife, hydrology and botany resources. This situation was discussed among IDT members both in and outside of IDT meetings. A proposal was drafted to defer from treatment stands with unique ground cover which connect wet areas and riparian reserves. These stands were selected through aerial photo interpretation and ground verification to develop a unique variable width buffer that runs north/south through the project area (see figure 2-5 in the EA).

Stands selected for inclusion in the corridor would provide botanical, hydrological and wildlife resources lacking in the area or threatened by the project proposal. As a result, selected stands had high amounts of understory huckleberry plants, scatters mesic sites which have a moderate well-balanced supply of moisture, and hydric soils which often develop anaerobic conditions in the upper levels of soil due to high amounts of water. These mesic and hydric sites support unique plant communities with high species richness and include meadows and riparian areas. Many of these acres in the proposed corridor have the least amount of skid roads from previous harvest. Their soils are not as disturbed and compacted as nearby areas and they support surface water features. These stands are currently providing dispersal habitat for northern spotted owls. Many stands that once provided dispersal habitat have been recently destroyed by wildfires or degraded by harvest activities.

Timing of the harvest deferment from this corridor is critical. Degraded habitat areas are not expected to be fully functional as dispersal habitat for another 20-30 years. During that period, the corridor would help alleviate lack of dispersal habitat in the project's drainage. The corridor would serve as a refuge for many species by preserving them through this harvest rotation and providing seeds and propagates to colonize surrounding areas.

Some concerns existed within the team as to potential impacts to the stated purpose and need of improving stand growth and vigor as well as reducing fire behavior and severity. Without treatment stands in the corridor would continue to grow under dense, competition

induced stress. This area would remain susceptible to insect and disease damage. By not thinning these areas, the ability of the treated project area to serve as a fuel break may be diminished. Stands to the east are generally dense, conifer forests, mostly wilderness. Any fire moving from the east to west along the path of most wind driven fire events, would build up speed and intensity in these stands before breaking out onto the bench of treated area that would be the Presley's Twin project. The corridor may reduce the effectiveness of project treatment by providing a bank of stands that may harbor intense fire behavior. However, much of the area immediately east of the Presley's Twin project has already been burned by recent fires.

Alternatives 2 and 3 respond to this significant issue through a mitigation measure of deferred harvest in the before mentioned corridor. The corridor is explained in greater detail in section 1.8.3.

Selective thinning will help shift the tree species composition and create a diverse plant community. Western red cedar and hardwoods will be retained and will benefit from the removal of surrounding fir. Thinning the under story fir stands will also create better conditions for the establishment of shade tolerant trees, like Western Red Cedar, Western Hemlock, and Pacific Yew.

Plant diversity and abundance should generally increase along thinned riparian areas. Thinning dense stands of Fir is expected to result in suitable conditions for a number of under story species. The abundance of existing herbs and shrubs is expected to increase, and the increased light and nutrients may lead to establishment of additional species. Species adapted to survival under a dense over story, however, may be displaced.

Thinning in the riparian reserves will increase structural diversity as individual riparian trees increase in size at a faster rate due to increased light and available nutrients. These larger trees will eventually (>50 yrs.), provide snags and down wood of larger diameter than would not otherwise have been available. In the interim snags resulting from logging damage will provide needed material.

ACSO 9. Maintain and restore habitat to support well distributed populations of native plant, invertebrate and vertebrate riparian dependent species.

BMP's and mitigation measures designed to address In stream and riparian habitats (ie. seasonal restrictions, canopy closures requirements, and soil protection requirements), should help minimize impacts to riparian-dependent invertebrate and vertebrate species. Individual species may experience short term impacts through canopy opening and yarding of material from riparian reserves. These short term affects are not anticipated to effect the distribution of populations of these riparian dependent species. This anticipation is based on past disturbances (natural), within the area and the plant, invertebrate, vertebrate, and riparian dependent species populations' response.

Thinning is expected to increase the abundance of native herbs and shrubs because more light and nutrients will be available for growth. The increase in plant biomass is expected to lead to increased prey base (insects and arthropods) for animals associated with riparian areas.

Epiphytic lichens and mosses will benefit from the retention of hardwoods and Pacific yew, as well as the larger trees that will result from the thinning. Species requiring down wood, including fungi, lichens, mosses, and a variety of mollusks, bryophytes and animals, may suffer a short term (1-50 years) loss of habitat as trees are removed that otherwise would have eventually fallen to the ground and provided habitat.

Finding and Conclusions:

Having reviewed the individual Aquatic Conservation Strategy Objectives , short-term and long-term impacts of the Presley Twin project were considered, and collectively looked at the for entire 5th field watershed, Upper North Santiam 5th field watershed, 146,715 acres, (HUC 1709000501), the proposed action is consistent with those objectives and will meet and not prevent the attainment of the Aquatic Conservation Strategy.

Submitted by: _____
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Approved by: _____
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Appendix F – Monitoring Plan

Silviculture

Shelterwood Overstory Removals

- Monitor tree marking or other tree selection methods to ensure the proper number and size of overstory trees are left in each unit (Presale Crew).
- Monitor tree falling and yarding to minimize damage to the understory crop stand. Limit creation of non-stocked areas to not greater than 10% of the unit that is not currently an existing skid road or landing (Timber Sale Administrator).
- Units would be surveyed to determine any reforestation needs resulting from timber harvest or fuel treatment (District Silviculturalist).
- Stocking surveys would be conducted to determine pre-commercial thinning needs (District Silviculturalist).
- Inspect timber stand improvement and reforestation contracts.

Commercial Thinning/Post & Pole

- Monitor designation-by-description and/or tree marking to ensure that it is consistent with silvicultural prescription objectives for basal area and tree selection (Presale Crew).
- Monitor tree falling and yarding to minimize damage to the residual stand, especially if operating during sap flow.
- Limit bole damage to not greater than 5% of the residual stand.
- Maximize use of existing skid roads and landings (Timber Sale Administrator).
- Monitor underburning.
- Limit residual stand mortality to not greater than 5% (Prescribed Burn Boss).
- Contingent on funding, complete post sale stand exams and update the Forest vegetation database (District Silviculturalist).

Regeneration Treatments

- Monitor leave tree selection to ensure that the prescribed number and quality of trees are designated to be left. Ensure that dwarf mistletoe infected trees are not selected as leave trees (Presale Crew).
- Monitor operations in order to maximize use of existing skid roads and landings (Timber Sale Administration).
- Conduct pre-planting surveys to determine site plantability. Inspect reforestation contracts for compliance.
- Conduct required reforestation survival exams for compliance with Forest recommended stocking levels (District Silviculturalist).

Fire and Fuels

Monitoring of fuels treatments activities will include ocular and photo series assessments of treated areas for the purpose of evaluating the success of implemented fuels reduction plans. Monitoring activities will continue until fine fuel loads have been returned to background levels (7-11 tons/acre).

Wildlife

Habitat should be provided for primary cavity excavator species and monitored at the subdrainage level. For details see the Willamette Forest Plan p.IV-65-66.

Botany

The proposed harvest units and associated road system will be monitored for invasive weeds for five years after harvest is complete.

Soils

- As the proposed project is initiated, it will be monitored to evaluate implementation efficiency, prescription adequacy, and to update sale area rehabilitation needs or protection. Primary implementation monitoring will be conducted at the contract administration phase of the project by the Timber Sale Officer. The logger will be required to maintain adequate suspension during the harvest process, remain on designated skid roads and landings with equipment, and to limit the number and extent of skid road utilized. In addition, a host of other contract requirements dealing with such items as erosion control, hazardous material use, fire restrictions, etc. will be enforced.
- Duff retention will be monitored as part of any post sale activity that may affect the soil resource, such as spot or pile burning, grapple piling, or broadcast burning.

Hydrology

- Stand response to treatment would be evaluated in 3 years to ensure success of planted trees.
- At 10-15 years a stocking check would be made to look at stand condition.
- Riparian conditions would be monitored as to their response to treatment and species composition. This would be part of Best Management Practices monitoring.
- Riparian areas not treated would be monitored to determine the effect of no treatment in relation to treated areas.