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Environmental Assessment

Traverse Creek Thin Project

**Middle Fork Ranger District, Willamette National Forest
Lane County, Oregon**

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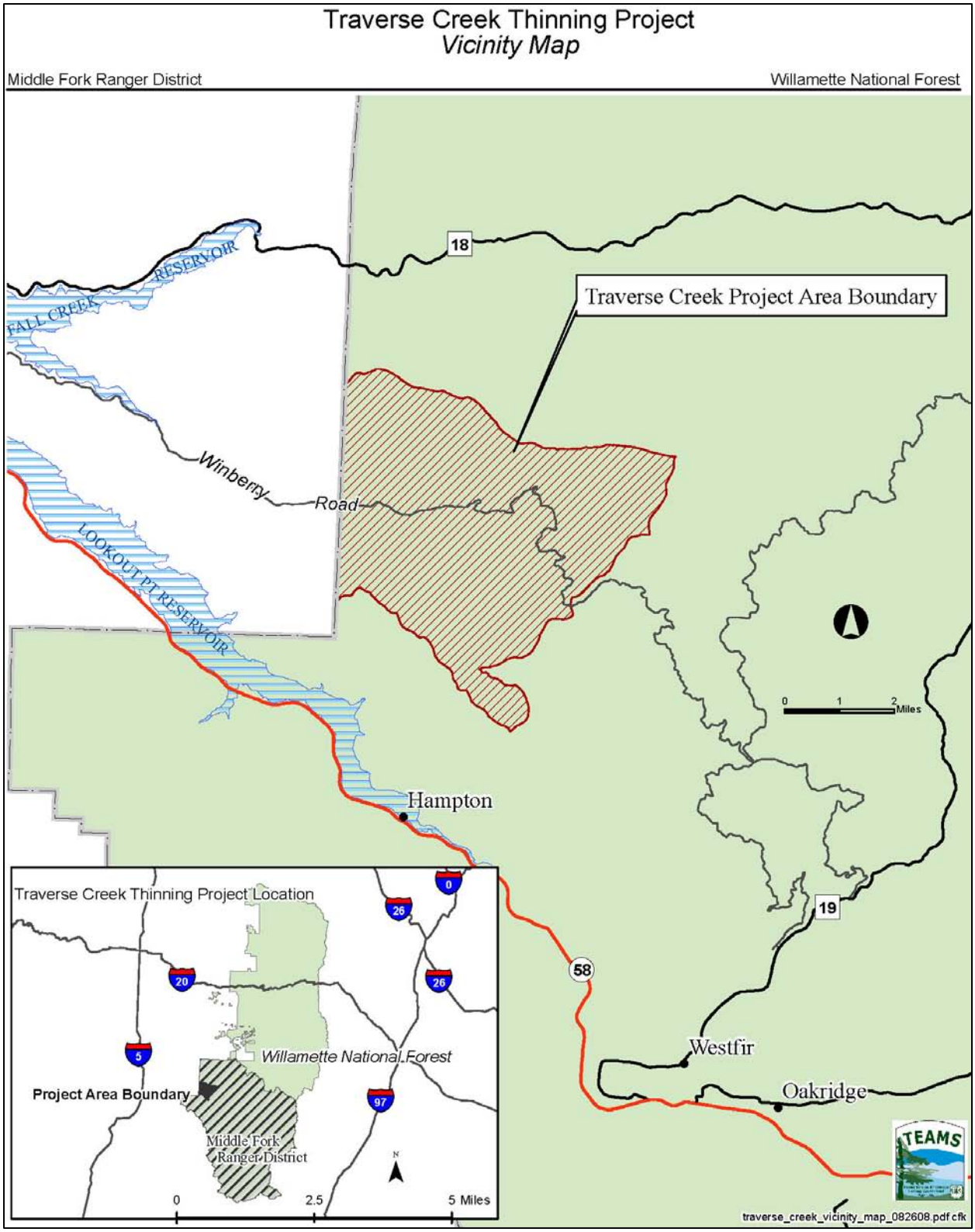

Figure 1. Vicinity map showing location of the Traverse Creek Thin project area

Chapter 1 – Purpose and Need

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 (EA) discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into the following sections:

Chapter 1 – Purpose and Need: The chapter 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 chapter also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2 - Alternatives, including the Proposed Action: This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. The alternatives were developed based on significant issues raised by the interdisciplinary team, from public comments, or from consultation with other agencies. This chapter also includes a listing of possible mitigation measures associated with the alternatives. Finally, this chapter provides a summary table of the environmental consequences associated with each alternative.

Chapter 3 - Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each resource area, the current condition of the resource is described first, followed by the effects of each alternative.

Consultation and Coordination: 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 located at the Middle Fork Ranger District Office in Westfir, Oregon.

Background

The planning process for the Traverse Creek Thin Project was started in 2007. The project is located in the Winberry Creek watershed. Winberry Creek is a tributary to Fall Creek, in the Middle Fork Willamette River subbasin (Figure 1). The Traverse Creek Thin Project planning area encompasses the Brush, North Winberry, Monterica, and Lower South Fork Creek subdrainages approximately 10 miles east of Lowell, Oregon. The legal description of the area is T. 19 S., R. 2 E., Sections 16-36, of the Willamette Meridian.

Purpose and Need for Action

The purpose of this project is to commercially thin, young timber stands in the Winberry Creek drainage. The majority of project area (12,088 acres of the total 14,000 acres) is designated as Management Area 14A - General Forest and Matrix in the Willamette National Forest Land and Resource Management Plan (LRMP; USDA Forest Service 1990) 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 (Northwest Forest Plan; USDA Forest Service and USDI Bureau of Land Management 1994b). The timber stands located within these land allocations have the objective to produce a sustainable yield of timber based on the growth potential of the land that is compatible with multiple-use objectives and meets the environmental requirements for soil, water, air and wildlife habitat quality. Matrix is where most of the scheduled timber harvest that's contributing to the probable sale quantity is conducted on suitable forest lands. The desired future condition is to maintain the growth and health of these stands, which provides prevention and protection against insects, diseases, and wildfires. Commercial thinning is one of the proposed stand treatments in the LRMP used to accomplish these objectives. Commercial thinning is scheduled to control stocking levels, when stand diameter and basal area make it economically feasible (MA-14a-13). Commercial thinning would also diversify the species composition and stand structure, while providing for an intermediate harvest of merchantable size trees for commercial timber products.

There is a need to provide for or accelerate the development of various stand structures or components such as ground vegetation, secondary canopies, large complex crowns, and/or appropriately large sources of dead and/or down tree habitat in order to fully accomplish the Northwest Forest Plan objectives for Matrix and Riparian Reserve lands (pages B-5, 6 and 9). Such diversification of these habitats would serve to maintain and enhance populations of animals and plants that require multi-storied conifer stands and coarse woody material.

Recent research (Carey et al. 1999, Tappeiner et al. 1997) has identified the need for silvicultural treatments in these stand-types to accelerate the development of late-successional forest characteristics. Although located within the Matrix Lands of the Northwest Forest Plan, carrying out these types of treatments here would increase future management options on the landscape level. Desired conditions for late-successional forest characteristics include the development of large trees, multi-storied canopies, horizontal patchiness, and species diversification. The existing conditions of these stands are a result of previous intensive timber management regimes. The stocking levels and structure of these stands exhibit symptoms that could delay the development of late-successional forest characteristics. Thinning treatments could ensure the health and improve the growth of these stands, diversify the stand structure, and accelerate their development of late-successional forest characteristics.

There is also a need to reduce open-road density, which is high in the planning area. Closure of roads would reduce disturbance to big game and decrease open road density to within LRMP standards and guideline levels. According to the big game habitat effectiveness analysis contained in the Winberry and Lower Fall Creek Watershed Analysis (USDA Forest Service and USDI Bureau of Land Management 1996), the three big game emphasis areas in the project area have road density values above the maximum densities specified in the LRMP. Reduction of the road system in this area is recommended in both the Forest Roads Analysis Report (USDA Forest Service 2003) and the Middle Fork Ranger District Supplemental Road Analysis (USDA Forest Service 2004). The closure of roads would provide the opportunity to store the roads in a

hydrologically stable condition. The reconstruction and maintenance of roads would provide an opportunity to repair ditches and cutslopes failures along roads that may be contributing sediment into the streams, and replace culverts that are migration barriers for aquatic species.

There is also a need to improve and increase the amount of big game foraging habitat. The watershed analysis is over 10 years old (USDA Forest Service and USDI Bureau of Land Management 1996) and forage levels in these three big game emphasis areas are close to falling below standard and guideline levels. There is an opportunity to improve big game habitat effectives in this planning area by coordinating forage improvement projects with the commercial thinning and road closures.

Proposed Action

The Middle Fork Ranger District proposes to commercially thin 35- to 60-year-old timber stands in the lower Winberry Creek area. The timber sales are planned to be sold over a period of about 3 to 5 years starting in 2009. The following activities would take place:

- Commercial, variable density thinning of about 2,564 acres of second growth timber stands yielding about 40 million board feet of timber products
- Fuel treatment of about 2,450 acres by whole-tree yarding and grapple piling and burning along some roads.
- Maintenance of roads to access units and improve water quality
- Construction of temporary roads to access units or utilizing the roadbed locations of temporary roads from previous entries
- Closure of roads after the timber sales to reduce open-road density and improve big game habitat quality and water quality
- Harvesting includes dominant-tree-release gap openings up to 1 acre to improve big game foraging values

Decision Framework

The responsible official for this proposal is the district ranger of the Middle Fork Ranger District, 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. The responsible official can decide to:

- Select the proposed action, or
- Select an action alternative that has been considered in detail, or
- Modify an action alternative, or
- Select the no-action alternative

The scope of the project and the decisions to be made are limited to whether these stands need to be commercially thinned, what type of log-yarding system would be used to remove the trees, which roads need to be maintained or reconstructed to access the treatment units, which roads would be closed after the project, how to manage post-harvest fuel loading, how to restore or mitigate detrimental soil conditions, what mitigation measures would be necessary to reduce adverse effects of the project, the list of prioritized other resource projects that would be funded, and what to monitor during and after implementation of the Traverse Creek Thin Project.

Planning and Management Direction

Development of this EA follows implementing regulations of the Forest and Rangeland Renewable Resources Planning Act of 1974; Title 36, Code of Federal Regulations, Part 219 (36 CFR 219); Council of Environmental Quality, Title 40; CFR, Parts 1500-1508, National Environmental Policy Act (NEPA).

Many federal and state laws, including the National Forest Management Act (NFMA), Endangered Species Act, Clean Air Act, Clean Water Act, and National Historic Preservation Act of 1966 also guide this analysis along with executive orders and federal regulations.

A summary of how this project and the design of alternatives comply with laws, orders and regulations can be found in Appendix A.

Willamette National Forest Land and Resources Management Plan (LRMP)

The project implements the direction of the LRMP as amended by the Northwest Forest Plan. Northwest Forest Plan land allocations amended the LRMP management areas in 1994. The Northwest Forest Plan supersedes any direction in the LRMP, unless the LRMP management area and or standards and guidelines are more restrictive.

Management goals and objectives, descriptions of each area, and applicable standards and guidelines can be found in the LRMP, Chapter IV, and the Northwest Forest Plan, Attachment A to the Record of Decision. Figure 2 displays the location of the management areas and Table 1 presents acreages and percentages of the management areas within the project area. Proposed activities would occur in the General Forest and Riparian Reserves management areas.

Table 1. Acres and percent of Willamette LRMP management areas within the project area

Management Areas	Management Area Code	Acres	Percent of Project Area
General Forest	14A	12,088	86
Late successional reserve-100-acre	16B	677	5
Wildlife habitat-pileated woodpecker	9B	332	2
Wildlife habitat-marten	9C	199	2
Wildlife habitat-special areas	9D	722	5
Developed recreation – F.S. site	12A	19	-
Totals		14,037	100

The project area is allocated to six management areas (Figure 2). The dominant allocation is General Forest, which makes up a majority of the project area. There are also some smaller inclusions of management areas throughout the project area such as three Wildlife Habitat allocations for pileated woodpecker, martens and special areas; and 100-acre Late Successional Reserves.

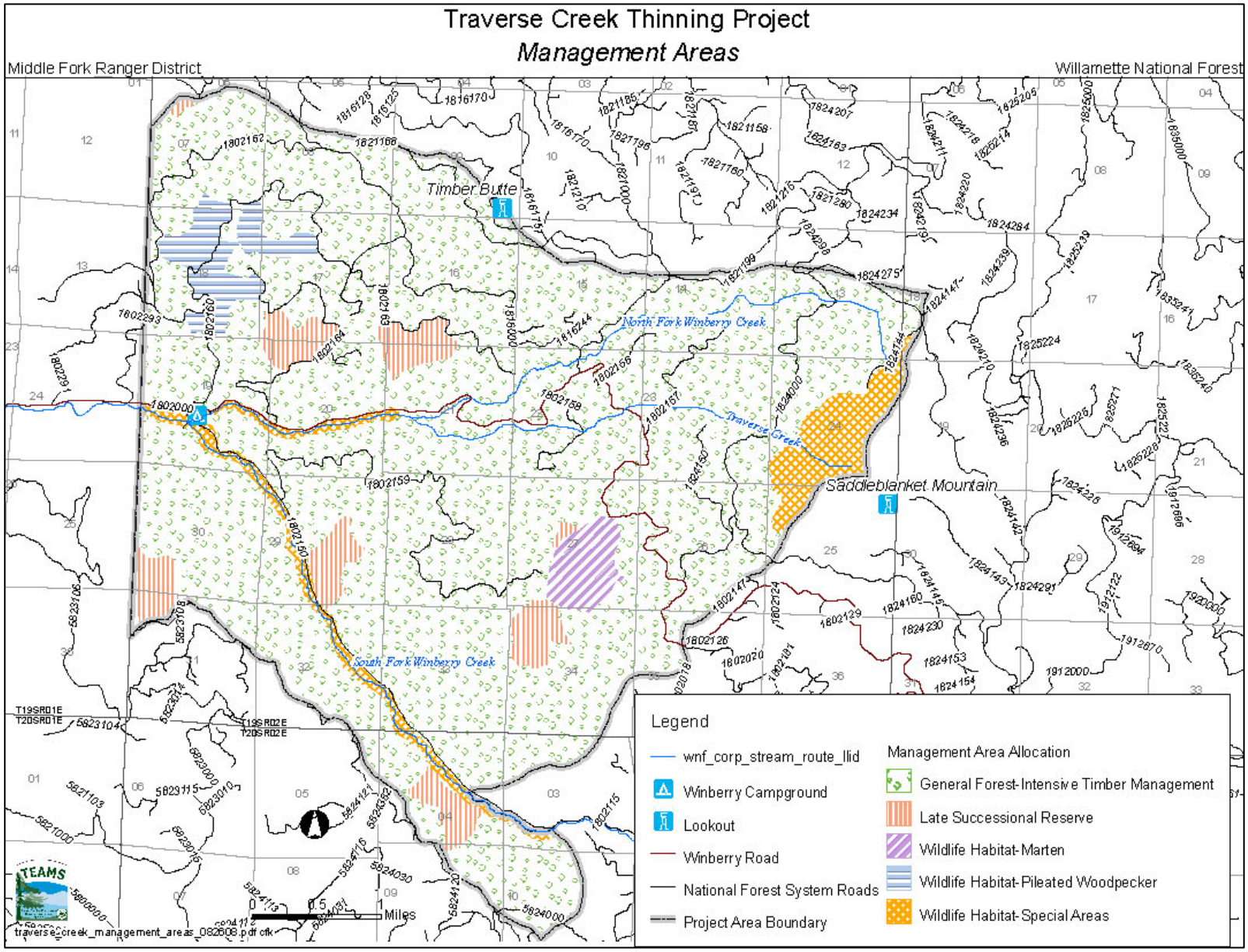

Figure 2. Map of LRMP management areas for Traverse Creek Thin project area

General Forest (Management Area - 14A)

The General Forest designation has the primary objective of producing 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 of all resources (USDA Forest Service 1990, pp. IV 227-230). The General Forest management area makes up about 2,190 acres, or 85 percent of the total project area. The other management area standards and guidelines that relate directly to the purpose and need for the proposed action include:

MA-14a-13 – Commercial stocking level control, based on DBH and basal area, should begin when economically feasible. The first entry could be delayed until the average stand diameter is about 12 inches. It is recommended that a 20-year interval be planned between thinning. Generally, scheduling will be predicated on two commercial thinnings in the Douglas-fir-Hemlock and Douglas-fir-True Fir strata. The scheduled thinning and stocking levels specified will be based upon site-specific data obtained by appropriate stand examination procedures.

MA-9D - This management area is to protect or enhance unique wildlife habitats and botanical sites that are important components of healthy, biologically diverse ecosystems. They include special or unique wildlife and botanical resources such as dry meadows, cliffs, caves, talus, mineral springs, wet meadows, marshes, and bogs. The project encompasses 722 acres of MA-9D, or 3 percent of the total project area. The following management area standard and guideline relates directly to the purpose and need for the proposed action, which includes improving biodiversity and future wildlife habitat:

> MA-9d-09 - Vegetative treatments, including commercial harvests, should be permitted if necessary to meet established wildlife objectives. Specific MAs for wildlife include Northern Spotted Owl Habitat Area (MA-9a), Pileated Woodpecker Habitat Area (MA-9b), Marten Habitat Area (MA-9c), Special Habitat Area (MA-9d), and Riparian Areas (MA-15). Sustained timber production is not a management area objective.

MA-12a - Direction is to provide a range of recreation opportunities dependent on developed facilities. Winberry Campground, Saddleblanket Lookout, and Timber Butte Cabin are within the project area. A number of trails are in or near the project area.

Eight standards and guidelines address water quality in management areas other than riparian; 41 for MA 15 (riparian); and 8 specific to water quality.

LRMP Standards and Guidelines

LRMP Forestwide (FW) standards and guidelines can be found on pages IV-73 to IV-80 and General Forest management area standards and guidelines on pages IV-227 to IV-230. The following standards and guidelines are the most pertinent to the proposed action:

- FW-181: Regulated timber harvest shall occur only on suitable lands for timber production and NFMA Section 6 (g) (2) (A))
- FW-182: Timber should not be harvested until it has reached or surpassed 95 percent of culmination of mean annual increment (CMAI) in cubic feet. (Exception made for commercial thinning and to meet other resource objectives)
- FW-192: Prior to removal of woody plants to increase growth of timber crop trees, a prescription shall be developed that ensures no native species should be eliminated from the site.

Standards and guidelines for wildlife are presented at the Forest level (LRMP, FW-121 to FW-174) or management area level.

Twenty-eight separate standards and guidelines including Federal and State statute and regional guidelines address road construction and maintenance, streamside protection, and management of mass movement. There is also a Forestwide standard to address watershed enhancement.

Soil and water quality standard and guidelines are found in FW-079 to FW-114.

Standards and guidelines for the identification and protection of cultural and historically significant resources include FW-263 to FW-274. The management process described in these forestwide standards includes the formal consultation process with Oregon State Historic Preservation Officer (SHPO), and as necessary, the Advisory Council on Historic Preservation (ACHP) (FW-267).

Tiered Documents and Local Assessments

Willamette Land and Resource Management Plan as Amended

This EA is tiered to the *Final Environmental Impact Statement* (FEIS) *for the Land and Resource Management Plan –Willamette National Forest* (USDA Forest Service 1990a) and the *Final Supplemental Environmental Impact Statement on the Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl* (also known as the "Northwest Forest Plan"; USDA and USDI 1994). Also incorporated by reference are the *Willamette National Forest Land and Resource Management Plan* (LRMP; USDA Forest Service 1990) as amended by the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* and *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl* (USDA Forest Service 1994). The Willamette LRMP as amended provides a forest-level strategy for managing land and resources and the Northwest Forest Plan provides a regional strategy for management of old-growth and late-successional forest ecosystems on federal lands. The plans provide direction, land allocations or management areas, and standards and guidelines for the management of National Forest lands within the project area.

Soil Laws and Regulations

36 C.F.R. 219.14(a) directs the Forest Service to classify lands under their jurisdiction as not suited for timber production if they fall into any of four categories 1) Non-forest, 2) Irreversible soil or watershed damage (from NFMA 6(g)(3)(E)(i), 3) No assurance of reforestation within five years, and 4) Legislatively or administratively withdrawn.

Executive Orders

Executive Order 11988 requires government agencies to take actions that reduce the risk of loss due to floods, to minimize the impact of floods on human health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Executive Order 11990 requires government agencies to take actions that minimize destruction, loss, or degradation of wetlands. Streamside Riparian Reserves, seeps and other wet habitats are assessed too.

Forest Service Policy

The Forest Service Manual (FSM) directs the agency to "*identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species*" (FSM 2670.31 (6)). The Forest Service Manual also directs the Regional Forester to identify sensitive species for each National Forest where species viability may be a concern. Under FSM 2670.32, the manual gives direction to analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.

Forest Service Manual 2670 directs the agency to ensure the viability of sensitive botanical species and to preclude actions that would contribute to the federal listing of a species. To ensure compliance with this direction, a biological evaluation is required for forest management activities that may alter habitat for proposed, endangered, threatened, or sensitive species (FSM 2671.44) in order to determine the possible effects of the proposed activities on these species.

Forest Service Manual R-6 Supplement No. 2500.98-1 (Title 2520 – Watershed Protection and Management; USDA Forest Service 1998) clarifies direction for planning and implementing activities in areas where soil quality standards are exceeded from prior activities; redefines soil displacement; provides guidance for managing soil organic matter and moisture regimes.

Other Direction

Additional management direction is provided for the conservation of migratory landbirds. This direction is consolidated in the Forest Service Landbird Strategic Plan and further developed through the Partners in Flight Program.

Management objectives for deer and elk habitat apply to specific mapped "Big Game Emphasis Areas" (BGEA) within the Willamette National Forest. Effects to these species will be discussed.

The LRMP has a provision*; "special wildlife and plant habitats not currently identified in non-harvest management areas shall be maintained. This should include the ecotone and a buffered area sufficient to maintain the microclimate of the site"*. The Willamette National Forest Special Habitat Management Guide (Dimling and McCain 1992) outlines habitat types and their importance to wildlife species, describes how to map habitats, and provides a methodology to delineate the buffer to maintain microclimate.

The Pacific Northwest Region entered into an agreement with the State of Oregon adopting "General Water Quality Best Management Practices" (BMPs) in November 1988. These BMPs were integrated into the LRMP as management direction. Specific information on how to correctly integrate BMPs into the NEPA process is found in Appendix H of the LRMP FEIS. Best management practices are practices or combinations of practices determined by the State after problem assessment, examination of alternative practices and appropriate public participation, to be the most effective, practicable means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals (Federal Register, Volume 40, No.230 dated 11/28/75).

The Willamette National Forest Integrated Weed Management Environmental Assessment (USDA Forest Service 2007) amended the LRMP and tiers to the Region 6 Final Environmental Impact Statement for Preventing and Managing Invasive Plants (R6 FEIS and ROD; USDA Forest Service 2005a and 2005b).The Willamette Integrated Weed Management program goals are to

contain established infestations and to eradicate new invader infestation a 753 weed sites on 9,700 acres on the Forest.

Other Management Information

The Interagency Winberry and Lower Fall Creek Watershed Analysis (1996) is incorporated by reference. The analysis will provide site-specific information that will help prepare prescriptions that will move the area toward the desired future condition.

The Willamette National Forest Road Analysis Report (USDA Forest Service 2003) and the Middle Fork Ranger District Supplemental Road Analysis (USDA Forest Service 2004) is incorporated by reference. The forest road analysis provides the responsible official with information needed to identify and manage a minimum road system that is safe and responsive to public needs and desires, is affordable and efficient, has minimal adverse effects on ecological processes and ecological health, diversity, and productivity of the land, and is in balance with available funding for needed management actions. The District road analysis evaluated each individual road segment on the District with criteria relating to terrestrial, aquatic, administrative, and public use factors. Based on the rating system, road closure recommendations for the District's transportation system were made. Copies of these documents are available at the Middle Fork Ranger District office in Westfir, Oregon.

Public Involvement

Public scoping was conducted by mailing a letter to 15 organizations, 5 individuals, and four Tribes, all of whom have shown interest in Middle Fork District projects in the past. The letter explained the purpose and need for the project, provided a vicinity map of the project area, and solicited comments on the proposed action. The primary comment period was July 30 to September 1, 2007. Two comment letters were received resulting from this mailing. Follow-up letters dated January 2, 2008 specifically designed to seek Tribal input were sent to the four Tribes.

The Traverse Creek Thin Project has been discussed during the 2008 Program Review with the Confederated Tribes of the Grand Ronde and Siletz. No comments have been received specific to the Traverse Creek Thin Project.

The Traverse Creek Thin Project was listed in the Willamette National Forest's Schedule of Proposed Action (SOPA) starting in the Summer Quarter of 2007. The SOPA is mailed out to a Forest mailing list of people interested in the management activities of the Forest. The SOPA provides one of the means of keeping the public informed of the progress of individual projects. The SOPA is also made available to the public on the Willamette National Forest website.

Two written comment letters and a phone call were received as a result of these notifications. Copies of the letters and documentation of phone conservations can be found in the Public Involvement section of the Analysis File. The following is a listing of individuals and organizations who submitted comments and a brief summary of the comment topics raised specific to the Traverse Creek Thin Project.

Table 2. List of commenters and summary of comment topics

Commenter	Comment Topic Summary
Oregon Wild	Supports variable density thinning and other actions that will create diversity and move the managed stands toward mature characteristics. Minimize gap opening size (¼ to ½ acre) Supports closing roads and other actions to benefit wildlife such as snag creation and large woody debris recruitment; and seasonal logging restriction and restrictions on logging in critical wildlife habitat. Minimize site-disturbing activities to protect soil, water and wildlife. Protect roadless area mapped by Oregon Wild
American Forest Resource Council	Supports project but expand opening size to 3-5 acres for big game forage. Keep roads open for recreation and fire control access. Maximize cost efficiency of project by minimizing harvesting and post harvesting costs such as fuel treatments.

The interdisciplinary team reviewed the comments and incorporated the concerns into the issues where applicable. Information related to these concerns was either addressed in the discussion of the issues and environmental consequences or can be found throughout the different sections of the EA or analysis file.

A public notice will be published in the local newspaper requesting comments on the proposed actions and EA. The comment period will be for 30 days. A letter will also be sent to the individual and organizations who have previously submitted comments to notify them that the EA is available for review and a second chance to comment on the project.

The responsible official will review all the comments along with their supporting reasons before making the final decision. The final decision on the selected alternative along with the rationale for that decision will be documented in a Decision Notice. The notice of the decision will be published in The Register Guard newspaper of Eugene, Oregon and sent out to the people who have submitted comments.

Additional information on public involvement can be found in the Chapter 4 section of this document, Consultation and Coordination. Copies of these various documents and their attached mailing lists can be found in the analysis file under Public Involvement.

Issues

Issues are points of concern about environmental effects that may occur as a result of implementing the proposed action. They are generated by the public, other agencies, organizations, and Forest Service resource specialists and are in response to the proposed action.

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 also determined based on the potential extent of their geographic distribution, duration of their effects, or intensity of interest or resource conflict, if not mitigated or otherwise addressed. The significant issues for this project were identified by the interdisciplinary (ID) team after scoping and preliminary analysis the project area and reviewing all the public comments. The significant issues were approved by the Responsible Official.

Significant issues are tracked through issue identification (Chapter 1), alternative development and description (Chapter 2), and Environmental Consequences (Chapter 3). Evaluation criteria have been identified for the all the issues and are used to compare alternatives (Table 6 in Chapter 2).

In addition to the significant issues other issues were raised by the public or Forest Service resource specialists. These issues were determined to be non-significant because of one of the following reasons: 1) outside the scope of the proposed action, 2) already decided by law or regulation, LRMP, or other higher level decision, 3) irrelevant to the decision to be made, or 4) conjectural and not supported by scientific or factual evidence. These issues are less focused on the elements of the purpose and need and did not influence the formulation of alternatives. Many of the non-significant issues are also included in the environmental effects analysis (Chapter 3) because of the relation to meeting LRMP standards and guidelines, laws, regulatory or policy direction, or relevant to resource analyses.

Significant Issues

The following issues were identified as the significant issues for the project area. These significant issues will be addressed through the development of a range of reasonable alternatives that meet the purpose and need for the proposed action. Alternatives are generally formulated by unit placement, unit design, or amount thinned to meet evaluation criteria of significant issues. The planning team studied, developed, and documented appropriate alternatives, and discussed in detail the significant issues in the environmental assessment as required by the National Environmental Policy Act of 1969 (NEPA).

Project Cost

There is a concern that costs associated with project implementation could be prohibitively high. High project costs could suppress bid prices or discourage some potential bidders. Costs of concern include road construction, reconstruction and closures, slash treatments, and logging requirements.

Evaluation Criteria:

- Miles and cost of temporary road construction
- Miles and cost of road maintenance
- Miles and cost of road reconstruction
- Miles of excavator piling along roads
- Acres of excavator piling in harvest units
- Acres of yarding tops and limbs
- Number and type of road closures
- Acres and type of slash treatment
- Harvesting operating season

Response: *This issue was determined to be significant because cost of management activities before, during, and after timber harvesting operation can affect the economic viability of the project. The road maintenance, temporary road construction, methods for managing activity fuels (including yarding of slash), road closures, logging operating season and other associated activities have costs that bidders consider against the perceived value of timber offered for sale. The amount or methods of carrying out such activities can vary while still accomplishing the*

necessary resource protections and improvements. Therefore, alternatives may vary in the amount, type, timing, or methodologies used to accomplish these activities.

Because differences in road management between alternatives have a major effect on cost, see the "Roads" section in Chapter 3 for cost differences between alternatives.

Gap Openings

There is a concern that ¼- to ½-acre gap openings are too small to create or sustain sufficient forage value. It is suggested that the typical gap size up to 1 acre be allowed. Others believe gap size should be 3 to 5 acres to maintain big game forage for the long term. Also in question is the number and location of gaps.

Evaluation criteria:

- Size of individual gaps
- Total acres as gaps
- Percentage of treatment area harvested as gaps

Response: *This issue is significant because the public identified a range of gap size preferences. Gap size and distribution affect how well the project purpose and need are met. Smaller gaps leave less of a management footprint, yet create vegetative diversity in the overstory and ground vegetation. Larger gaps create more big game species forage, sustain forage longer than do smaller gaps, and accentuate vegetative diversity. The overall acreage of gaps harvested may also influence the total volume of timber harvested.*

The differences in how the alternatives utilize gaps are discussed in the Chapter 2 description of alternatives and in the "Vegetation and Fuels" section of Chapter 3.

Road Density

Some believe that the current road density is too high and are concerned that new roads will be constructed, increasing the present road density. Others are concerned that too many roads may be closed and would limit access.

Evaluation Criteria:

- Change in road density following project compared to before project (miles/sq mile)
- Miles of new temporary road construction
- Miles of new closures due to this project
- Miles and duration of seasonal road closures

Response: *This issue is significant because the public identified a concern that the current road density is too high and may be increased, and that current road density may be decreased by road closures at the end of the project. High road densities are also identified in the purpose and need for the project. Those who wish to see road densities reduced tend to be concerned about roads channeling sediment into streams. Water quality, is particularly sensitive to the number of stream crossings. Also, they believe habitat destruction and fragmentation, edge effects, and exotic species invasions can be increased or aggravated by roads.*

Those who wish to see road densities maintained and support road construction emphasize that adequate road access is necessary for sportsman, fire control, and to support other management

activities. Further, seasonal road closures could contribute to these same concerns and limit logging access in some areas.

The description of alternatives in Chapter 2 states the difference in road density between in alternatives, especially Table 5 on page 23. The Roads section of Chapter 3 further elaborates on this topic.

Non-significant Issues

Vegetative Treatments

There is concern that the project could affect old growth, snags and coarse woody debris. There are concerns by others that thinning would be excluded in riparian areas.

Evaluation Criteria:

- Acres of old growth affected
- Density of snags (trees/acre)
- Volume of coarse woody debris (tons/acre)
- Dimension and restrictions of riparian buffers

Response: *This issue was not considered significant either because the resources identified would not be affected or the LRMP specifies adequate management direction to address these concerns. All harvesting would be in young, second growth stands. No harvesting would occur in old growth stands so concerns for protecting old growth trees and snags are met by not treating such stands. The proposed action would meet LRMP standards for density of snags and desired coarse woody debris (CWD) volume. Snag density and CWD volume proposed can be viewed in the Chapter 2 description of the proposed action (Alternative 2). The effects of the proposal on these resources can be viewed in Chapter 3 in the Vegetative and Fuels section.*

Riparian buffers limit where and how much harvesting may be done near streams. This issue is not considered significant because riparian buffer standards, including no-harvest buffers, would be agreed upon through the consultation process with fishery regulatory agencies and agreements to manage existing shade under the Clean Water Act. Actual dimension and specific requirements of each buffer would be determined for stream segments in each harvest unit. The prescriptions would include a no harvest zone adjacent to the stream, which varies in widths depending on the class of the stream and intensity of thinning proposed. Design criteria and mitigation measures address this issue in Chapter 2. The effects of the proposed action and the other alternatives on riparian management are addressed in Chapter 3. The option for no commercial harvest in the Riparian Reserves is available to the Responsible Official in the no action alternative.

Big Game Habitat Quality

Commercial thinning may affect quality and function of deer and elk habitat by changing the amount of forage, hiding, and thermal cover. Road management activities may affect open road densities either beneficially, by closing roads to decrease habitat disturbance or negatively, by increasing open road densities and habitat disturbance.

The three Big Game Emphasis Areas (BGEAs) that cover the analysis area are the Brush Creek, North Fork Winberry, and Lower South Fork Winberry/Monterica BGEAs. The watershed analysis for these areas is over 10 years old and forage levels in these three BGEAs are close to falling below standards and guidelines levels. There is an opportunity to improve big game

habitat effectiveness in this planning area by coordinating forage improvement projects with the commercial thinning and road closures. Management of these BGEAs is based on a set of habitat effectiveness objectives as identified in the LRMP standards and guidelines. The habitat effectiveness objectives for each variable should be within the range of 0.2 to 1.0 (see "Evaluation Criteria" below and Table 8 of the Wildlife Specialist Report and Biological Assessment/Evaluation located in the project record). Where existing habitat conditions result in values below this range, an increasing trend should be established through project implementation.

Proposed treatment units were clearcut between 1949 and 1972. The analysis area consists of contiguous blocks of even-aged stands of trees, interspersed with some old growth stands.

Evaluation Criteria:

- Habitat effectiveness, measured as decimal percentage for each of the following variables:
  - Forage quality
  - Cover quality
  - Open roads
  - Size and spacing of cover and forage
  - Overall Habitat Effectiveness index
- Acres thinned and percentage of elk emphasis areas
- Acres of improved quality foraging areas created

Response: *This issue was not considered significant because all action alternatives would be designed to meet the LRMP standards and guidelines for low and moderate rated big game emphasis areas (BGEA) (FW-135 – 146, 150-153). Commercial thinning in general has minimal impacts on big game and both proposed action alternatives establishes a trend to improve or maintain the "overall" Habitat Effectiveness Value for the given BGEAs. Project design would include road closures and creation of small openings (gaps) that would improve big game forage values. A forage seed mix would be used to seed some road segments when they are closed and put into long-term storage. The brief discussion of this issue can be found in the Chapter 3 – Environmental Consequences under Deer and Elk (Big Game).*

Fuels Management

Commercial thinning may affect the amount and distribution of fuels within a stand and could alter the effects of wildland fires on the landscape. Thinning commonly creates a fine fuel loading (0-3 inches) that exceeds LRMP standard and guidelines. Fuel prescriptions to reduce management activity-created fuels have been difficult and costly to implement under certain thinning prescriptions. This project could yield excessive fuel loads over large areas increasing risk of fire, fire intensity, rates of spread, risk to firefighter's safety, suppression cost, and potential for resource damage.

Evaluation Criteria:

- Post-treatment fuel loading (0-3 inch) tons per acre
- Acres of fuel reduction treatments in high risk or priority areas in the landscape

Response: *This issue was not considered significant because it is addressed by the LRMP standards and guidelines (FW-252) for 0-3-inch, management- created fuels (maximum acceptable; 7-11 tons/acre; USDA Forest Service 1990). All alternatives are designed to meet the LRMP standards and guidelines. The percent of management activity-created fuels will be the difference between the action alternatives. The focus of fuel management will be on the standard and percent of fuel reduction, more than the methods to accomplish desired fuel condition. However, treatment methods will also be discussed. The alternatives will present different short-term risk scenarios and cost of treatments. The discussion of this issue can be found in Chapter 3 – Environmental Consequences under Fire and Fuels.*

Water Quality/Stream Conditions

Commercial thinning and associated road management activities may affect water quality and the aquatic habitat. Timber harvest and roads interact and influence the production of sediments. Roads can intercept subsurface flow. Routes flow more quickly to adjacent stream channels potentially increasing peak flows.

Evaluation criteria:

- Miles of road maintenance
- Miles of temporary road construction
- Miles of roads closed and put into long-term storage

Response: *This issue was not considered significant because all alternatives would meet Clean Water Act regulations, and LRMP standards and guidelines. All action alternatives include the same mitigated measures such as the Riparian Reserve prescriptions and incorporate other Best Management Practices to maintain or reduce any impacts to within legal level. Mitigation measures address this issue in Chapter 2. The effects of the proposed action and the other alternatives are addressed in Chapter 3 in the Soils, Hydrology and Fisheries section.*

Threatened, Endangered and Sensitive (TE&S) and Old Growth Species

Thinning and associated road management activities may affect a variety of wildlife, fish and botanical threatened and sensitive species and their habitats within and adjacent to the project area. These activities may remove or degrade forest or aquatic habitat and create noise above ambient levels, which may disturb species at critical periods in their life cycles. TES species that are either known or likely to occur or have habitat that may support their existence in the project analysis area include: northern spotted owls, northern bald eagles, Harlequin duck, American peregrine falcon, Baird's shrew, Pacific shrew, Fisher, Pacific Fringe-tailed bats, OR slender salamander, Cascade Torrent salamander, Crater Lake tightcoil. Sensitive plant species found in treatment units include old-man beard (*Usnea longissima*) and Pacific felt lichen (*Peltigera pacifica*) and habitat exists for others.

The LRMP management indicator species for old growth include pine marten, pileated woodpecker, and northern three-toed woodpecker.

Evaluation Criteria:

- Effects determination
- Acres of short term (vs. long term) downgraded suitable owl habitat

Response: *This issue was not considered significant because all alternatives would meet the law (Endangered Species Act), regulations, and LRMP standards and guidelines. All actions that*

modify or disturb forest habitat would be required to follow conservation and protection guidelines provided by the LRMP and other consulted federal agencies. While there is a potential for short term adverse effects due to the disturbance, impacts to habitat are essentially the same for both of the action alternatives. Disturbance impacts are mitigated in the action alternatives with the same measures that have been commonly prescribed and used on other timber projects for several years. These mitigation measures are listed in Chapter 2. The effects of the proposed action and the other alternatives on TES species are addressed in Chapter 3.

Invasive weeds

Commercial thinning and associated road management activities may contribute to the spread of invasive weeds in the project area. The spread of invasive weeds displaces native plants, which may have an effect on biotic communities.

Evaluation Criteria:

- Acres of ground disturbance
- Miles of road work associated with harvest activities

Response: *This issue was not considered significant for designing alternatives because specific mitigating measures would be used in all action alternatives to prevent expansion of existing invasive weed populations. See Mitigation Measures in Chapter 2. The effects of the proposed action and other alternatives on invasive weeds are discussed in Chapter 3 under Vegetation and Fuels section.*

Unroaded Areas

Commercial thinning and associated management activities could compromise values of unroaded lands identified near proposed treatment areas.

Evaluation Criteria:

- Roadless area distance from project activity

Response: *This issue was not considered significant for designing alternatives because neither action alternative proposes entry into the unroaded area identified, therefore there are no effects and it will not be discussed further.*

Recreation

Commercial thinning and fuel treatments may decrease the current recreation opportunity spectrum (ROS) class acreages found in the project area.

Evaluation Criteria:

- Impacts to the ROS class are measured by determining whether the implementation of an alternative moves the land towards (meets), away from (does not meet), or keeps (no change) the area in its current ROS class designation.

Response: *This issue will be analyzed because the LRMP as amended sets ROS standards that must be met by projects that may modify recreation opportunities. This issue was not considered significant for designing alternatives because mitigations measures would be used to ensure that action alternatives maintain recreation opportunities in accordance with LRMP ROS standards.*

Chapter 2 - Alternatives, Including the Proposed Action

This chapter describes and compares the alternatives considered for the Traverse Creek Thin Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker. Some of the information used to compare the alternatives is based upon project design elements (such as acres of slash treatment by different methods and number of miles of road put into long-term storage) and upon the environmental, social and economic effects of implementing each alternative (number of log truck loads, logging cost per MBF, and present net values).

Alternative 1 – No Action

Alternative 1 is the no action alternative where the proposed project does not take place. No further activities would take place to manage the stands by thinning. The no action alternative provides a benchmark, or a point of reference for describing the environmental effects between Alternative 2 (proposed action) and Alternative 3.

Without treatment now, many of these stands would likely eventually develop into the desired structure as natural disturbances and competition-related mortality open up the stand and trigger the understory re-initiation stage of development. However, it is expected that this process would take substantially longer than under the proposed thinning regimes (Bailey and Tappeiner 1998). Thinning now would also broaden future management options by removing hazardous fuels and creating stands more resilient to disturbances (Poage 2001). This is especially true for the approximately 1,000 acres in the project area that have not been previously commercially or pre-commercially thinned.

No action would forgo the opportunity to harvest approximately 40 million board feet of timber that would be produced from these thinning prescriptions. A large portion of this timber would be in the form of trees that would die in the future from inter-tree competition.

Alternative 2 – Proposed Action

Alternative 2 is designed to implement the LRMP direction and meet standards and guidelines for the various forest resources. More specifically, Alternative 2 would:

- produce a sustainable supply of forest products according to LRMP direction (MA14a), which is the majority of this area,
- create biological diversity according to FW-201 of the LRMP, (USDA Forest Service 1990, p.IV-78)
- reduce open road density and increase big game foraging to improve big game habitat effectiveness (HE) according to FW-135 (ibid., p.IV-67).

This project area has over 2,900 acres of dense, even-aged, uniform, single-story, 35- to 60-year old plantations. This alternative is expected to yield approximately 40 million board feet of timber sawlogs to meet the purpose and need of maintaining the growth and health of the stands and producing a sustainable, commercial yield of wood products. The alternative uses a combination of ground-based, skyline and helicopter log-yarding systems with an emphasis on minimizing residual damage and disturbance.

In general, the trees in this project average 45 years of age, 14 inches in diameter, and 100 feet in height. Alternative 2 proposes to thin 2,564 acres. Moderate intensity thinning, leaving

generally 75 to 100 trees per acre, is prescribed for 2,144 acres. Heavy thinning, leaving about 50 trees per acre, is prescribed for 263 acres. Light thinning, generally leaving over 100 trees per acre is prescribed for 157 acres. Dominant-tree-release gaps up to an acre in size would occur on up to 385 acres (15 percent). Approximately 435 acres out of the original 3,000 acres considered for thinning would be left un-thinned. These include no-cut buffers along stream channels, areas with a large hardwood component, and areas with difficult access.

Log removal would be accomplished with a combination of yarding systems (see Figure 3 and Table 35 in Appendix E for treatment information for each harvest unit). Alternative 2 proposes the following combination of yarding systems:

- 1,004 acres of ground-based skidding
- 1,413 acres of skyline yarding
- 148 acres of helicopter yarding

The alternative would mitigate post-thinning fuels by yarding tops and branches on 2,408 acres and grapple piling along roads within treatment units on 120 acres. These proposed fuel treatments meet the purpose and need to manage fuel loadings within LRMP standards and guidelines.

Alternative 2 is designed to provide a high level of public access to the area by keeping most of the roads open. This alternative would implement only some of the proposed road closure in the Middle Fork District Supplemental Road Analysis. Most road closures would be of low cost and low intensity designs to store the roads in a hydrologically stable condition, but would allow for easy reopening. There would be about 4.5 miles of temporary road construction to access harvest units. Of this, approximately 1.0 mile would occur on existing old roadbeds.

Table 3. Summary of alternatives

	Unit of Measure	Alt.1	Alt. 2	Alt. 3
Timber Harvest				
Thinning Low Intensity	Acres	0	157	157
Thinning Moderate Intensity	Acres	0	2,144	2,144
Thinning High Intensity	Acres		263	263
Total Harvest Area	Acres	0	2,564	2,564
Gap area**	Acres	0	385	513
Estimated Timber Volume	MMBF	0	40	45
Logging Systems				
Ground-based	Acres	0	1,004	1,004
Skyline	Acres	0	1,413	1,413
Helicopter	Acres	0	148	148
Fuels Treatments				
Hand Pile and Burn	Acres	0	0	0
Grapple Pile/Burn along roads	Acres	0	120	40
Yard Tops Attached	Acres	0	2,408	2,092
Broadcast Burn	Acres	0	0	0
Total Fuels Treatments	Acres	0	2,450*	2,115*

*Notes: Acres of grapple pile/burn along roads and yarding tops have substantial overlap

** Gap area is not in addition to total harvest area. Gaps may be incorporated into any of the units regardless of thinning intensity and are part of the thinning intensity acres reported.

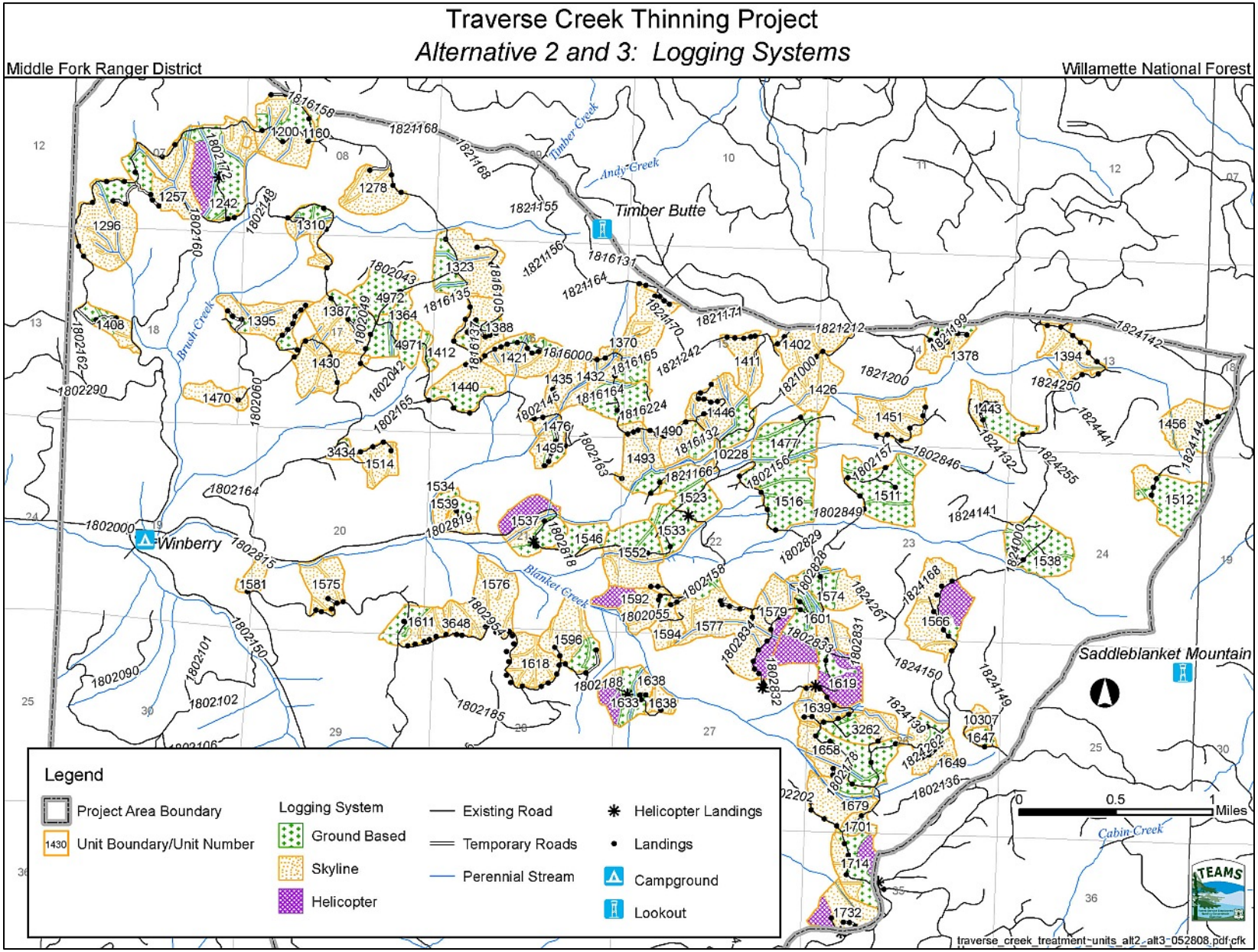

Figure 3. Map of proposed treatment units and logging systems in Alternatives 2 and 3

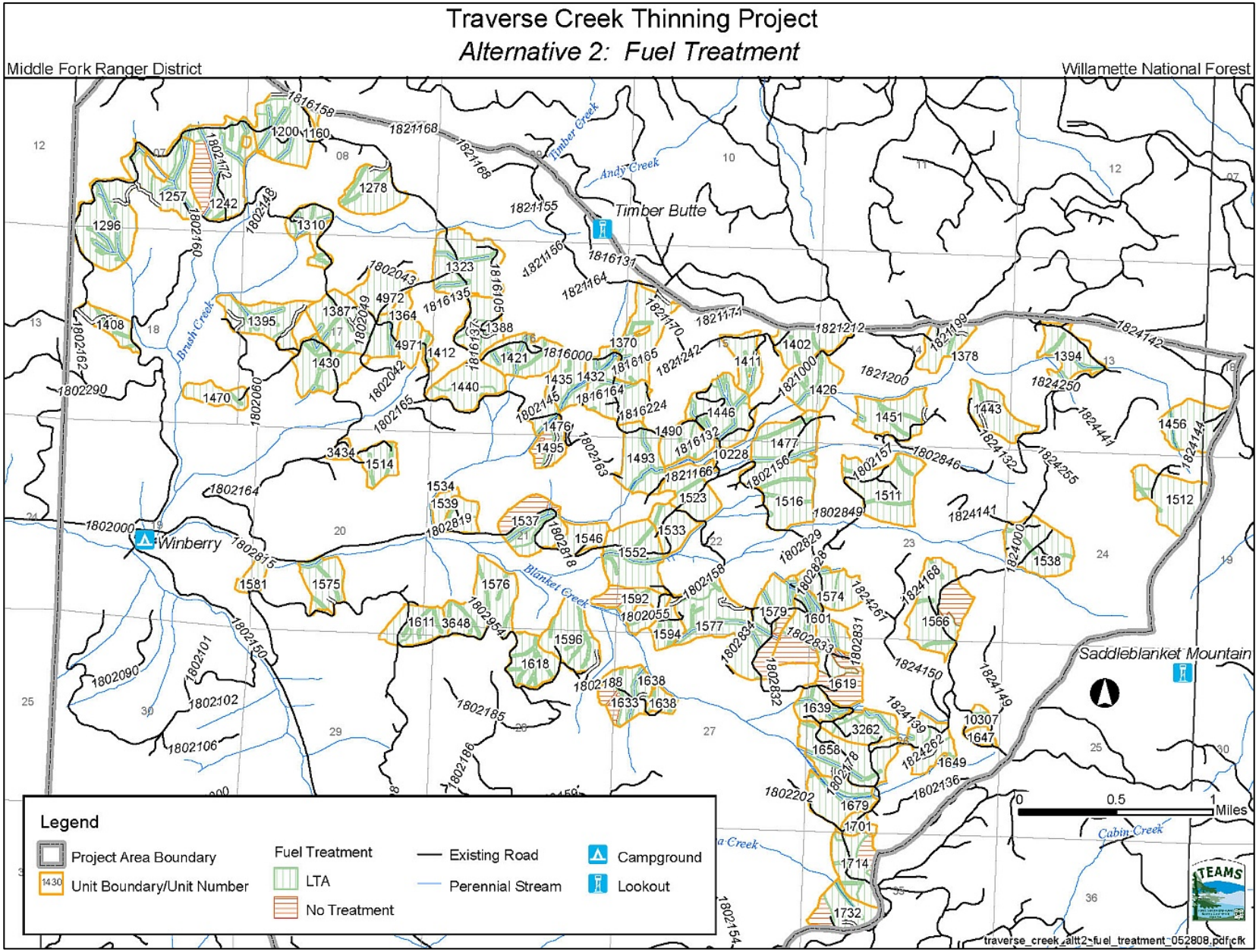

Figure 4. Proposed fuel treatments in Alternative 2 treatment units. LTA means leave tops attached so less fuel will be left on site

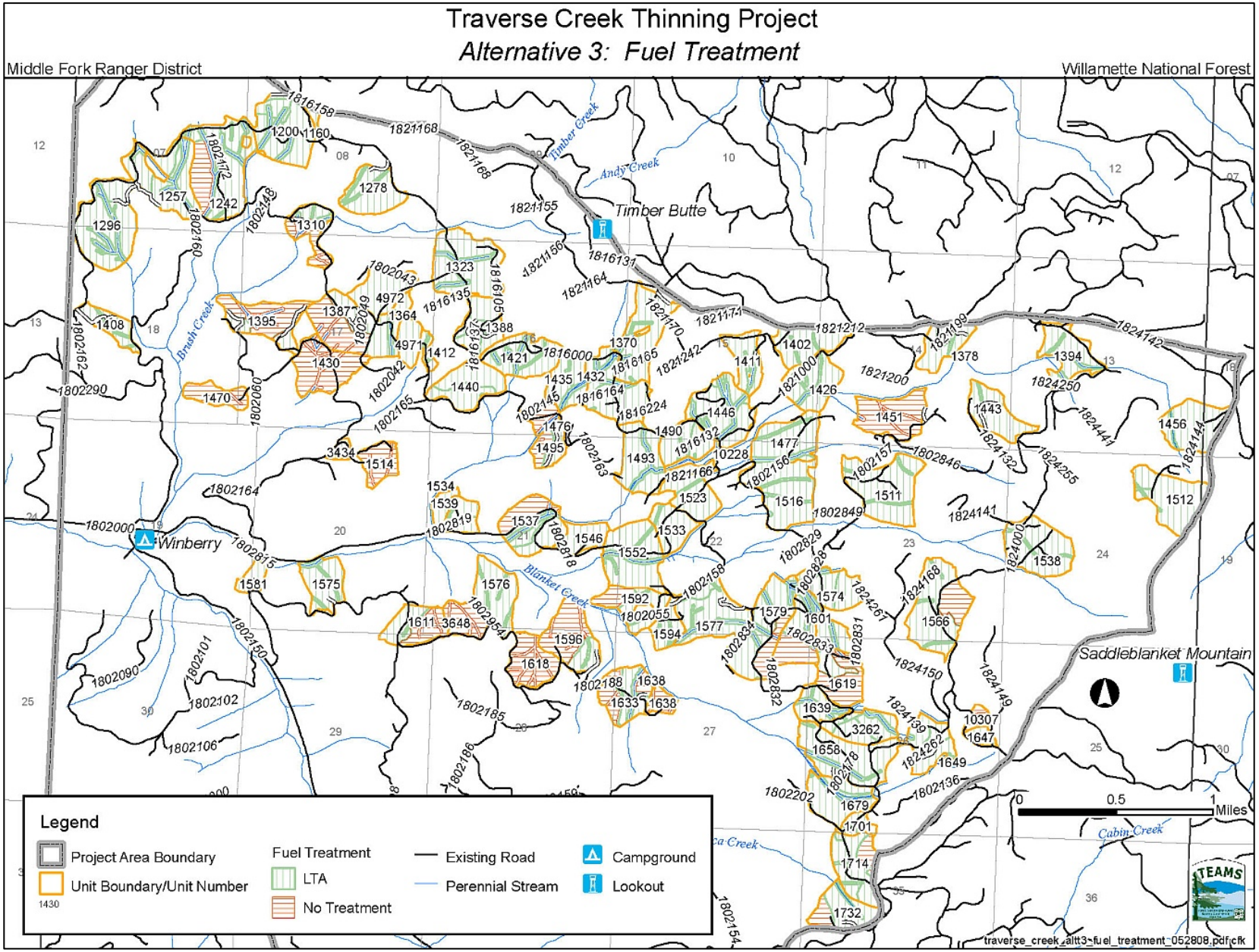

Figure 5. Proposed fuel treatments in Alternative 3 treatment units. LTA means leave tops attached so less fuel will be left on site

Road maintenance would occur on all haul routes which includes 66.8 miles of existing roads. The level of road maintenance will vary depending on the road segment (see Roads section in Chapter 3). Two perennial fish bearing stream crossing culverts under the main haul route Road 1802 would be replaced along with numerous other stream and ditch relief culverts during road maintenance activities. This alternative would close about 4.0 miles of roads by berming and/or gating; leaving the road prisms in a hydrologically stable condition. These road closures would meet the purpose and need to reduce open road densities and trend toward meeting standards and guidelines for big game habitat. All temporary roads constructed would be closed after completion of project activities.

Alternative 3

Alternative 3 proposes cost savings by lowering fuel treatment cost, road maintenance cost and eliminating closure of existing classified roads. Still, Alternative 3 would implement the LRMP direction and meet standards and guidelines for the various forest resources. Most notably:

- produce a sustainable supply of forest products according to LRMP direction (MA14a), which is the majority of this area,
- create biological diversity according to FW-201 of the LRMP,
- increase big game foraging to improve big game habitat effectiveness (HE) according to FW-135.

Alternative 3 has the same thinning treatments and logging systems as Alternative 2, but differs by having up to 513 acres (or 20 percent of the treatment unit area) in gaps, by reducing the amount of yarding tops on skyline units by 315 acres, and by reducing the amount of grapple piling along roads by 80 acres. Of the approximately 513 acres in gaps, 103 of these (20 percent) could be as large as three acres (see Table 35 in Appendix E for specific harvest and fuel treatments for each harvest unit).

Alternative 3 is designed to maintain access for fire protection, recreation, and administrative use. There would be about 4.5 miles of temporary road construction. Temporary road construction would be the same as Alternative 2. However, there would be about 5.1 fewer miles of road reconstruction and no road closures are proposed, except for closing the temporary roads constructed specifically for this project (Table 4). The 5.1 miles of roads not being reconstructed would receive routine, lower cost, road maintenance instead.

Like Alternative 2, this alternative would also consider the connected actions of other resource enhancement and restoration projects within the planning area that could be eligible for Knutson-Vandenberg Act (KV) funding generated by the timber sale(s).

Summary of Road Work Associated with Alternatives 2 and 3

Both action alternatives would provide a safe transportation system to adequately accesses proposed treatment areas. The differences between Alternatives 2 and 3 are the additional road closures and maintenance work proposed for Alternative 2 compared to Alternative 3. Overall, Alternative 3 road system project cost would be approximately $40,000 less than Alternative 2 (see Chapter 3, p. 49 for details of road system costs).

The culvert removal and placement schedule would be the same for both action alternatives. Major culvert actions would include repair of the Brush Creek crossings, removing and replacing the existing three-barrel configuration with a large single barrel crossing that would

provide fish passage. Both alternatives would also remove and replace the 60-inch culvert at Traverse Creek.

The definition of "road maintenance" activities and "low-level reconstruction" (defined below Table 4) are the same except road maintenance does not replace asphalt, or remove and replace culverts.

Table 4. Road reconstruction and maintenance summary (miles) – Alternatives 1, 2 and 3

	Alternative 1	Alternative 2	Alternative 3
Reconstruction			
Low	0.00	38.7	33.6
Moderate	0.00	4.0	4.0
High	0.00	2.1	2.1
Totals	0.00	44.8	39.7
Maintenance	0.00	22.0	27.1
Totals	0.00	66.8	66.80

Maintenance – includes everything listed in 'low-level reconstruction' except asphalt surfacing and culvert replacement. Mile-for-mile maintenance costs less than reconstruction.
Low-level reconstruction may consist of:

- brushing roadside vegetation
- falling of snags and danger trees
- blading of roadbed
- cleaning of ditches and culvert inlets and outlets
- removing slough and slide material,
- placing crushed aggregate or asphalt surfacing and
- removing and replacing or installing new ditch relief culverts.

These standard maintenance and/or reconstruction activities occur on all roads when commercial activity occurs or it occurs on a rotating basis determined by use and need.

Moderate-level reconstruction includes the same items of work as low level with the addition of replacing culverts in intermittent and perennial streams that are not fish bearing.
High-level reconstruction could involve all the work items in low and moderate levels with the addition of replacing culverts in fish-bearing perennial streams and repairing major road failures within riparian areas.

Table 5. Road closures summary – Alternatives 1, 2 and 3

	Alternative 1	Alternative 2	Alternative 3
Proposed miles of additional road closure	0.0	4.0*	0.0
Proposed open road miles	51.7	47.7	51.7
Proposed closed road miles	15.1	15.1	15.1
TOTAL	66.8	66.8	66.8

* rounded from 3.96

Design Criteria and Mitigation Measures Common to the Action Alternatives

In response to LRMP standards and guidelines, laws and regulations, and public comments on the proposal, mitigation measures were developed to ease some of the potential adverse impacts the various alternatives may cause. The mitigation measures applied to both of the action alternatives.

Vegetation

- No gaps would occur within 100 feet of any stream.

Roads

- Best management practices (BMPs), including placement of sediment barriers, provision of flow bypass, and other applicable measures, would be included in project design as necessary to control off-site movement of sediment (BMPs R-2, 3, 4, 5, 7, 8, 9, 12, 13, 14, 18, 19, 20 and 23).
- For any perennial stream crossing culvert replacement, a specific dewatering plan shall be included with the contract design provisions (BMP R-13).
- Any instream activity such as culvert replacement or instream wood placement occurring within fish bearing and other perennial streams would comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on instream work activities. For the Winberry Creek drainage, instream work must occur between July 1 and October 15, unless otherwise approved by ODFW (BMP T-5).
- All road reopening, reconstruction and temporary road building would occur during the dry season between June 1 and October 31 to avoid potential surface erosion of exposed soil (BMP R-3).
- All temporary roads shall be winterized if they are not to be used for extended periods of wet weather (LRMP FW-314, 315, 316, BMP R-23).
- To prevent sedimentation to the greatest extent possible, rock surfacing would be applied on all native surfaced roads to be used in the wet season between November 1 and May 31 (BMPs R-19, 20).
- Road maintenance along haul routes, including placement of additional surface rock, blading, brushing, ditch relief culvert cleaning or addition of ditch relief culverts shall occur as needed before, during, and after to project implementation (BMPs R-18, 19).
- At the completion of harvest activities, reopened roads and new temporary roads shall be water barred, seeded with approved forest mix design, and closed to vehicle travel to reduce potential for surface erosion and sedimentation (LRMP FW-101, 314-316, BMP R-23).
- All new temporary roads would be located at least 200 feet from a stream channel and on sideslopes of less than 30 percent.
- Wet weather log hauling would be monitored by the timber sale administrator and the hydrologist. When deemed necessary, log hauling may be suspended during heavy rainfall to prevent breakdown of road surface structure, pumping of fine sediment, and potential mobilization of sediment to streams (BMPs R-18, 20).
- Haul would be prohibited on native-surfaced roads during the wet season between November 1 and May 31 (BMPs T-5, R-18, 20).

- Winter log hauling would be allowed on roads 1802, 1816, 1821, 1824, 1802150, 1802159, 1802160, 1802162, 1821168, 1821199, 1824140, and 1824142, between November 1 and May 31. Haul will not cause damage to roads or National Forest resources. (BMPs T-5, R-18, 20).
- Under Alternative 2, approximately 4.0 miles of classified roads would be closed by blocking the entrance to the road to reduce the density of open road miles. These blocked roads are primarily to reduce disturbance to big game habitat, to rehabilitate roads for long-term storage in a hydrologically stable state, and to reduce the cost of road maintenance. The road block devices would be maintained over time to ensure the effectiveness of the closure. All temporary roads would be closed and put in a stable hydrologic condition after harvest activities.

Soils/Water/Fish

Riparian Buffers

- Any pile burning and grapple piling shall be kept outside of the designated no-cut buffers (LRMP MA-15-32, BMP F-2). See Appendix E for detailed listing of units where proposed grapple piling would occur.
- Stream buffers for the action alternatives include a minimum of 30-foot, no-cut buffers on all intermittent streams and 60-foot no-cut buffers on all perennial streams (BMPs T-7, 8). Between 60 and 170 feet along perennial streams, an average of 50 percent canopy closure would be maintained. Within no-cut buffers, tree felling or yarding is prohibited (with the exception of felling and yarding through skyline corridors, see specific mitigations under "Logging Operations"). Stream buffers are measured from the edge of active channel (stream banks) on both sides of the stream. The minimum buffers must be expanded to include the following features, if applicable:
    - Slope break = the point of topographic change below which management will result in active erosion or introduction of material into the stream channel or floodplain area.
    - Flood-prone area = area accessed by the stream during medium to large peak flow events, typically defined as the width at 2 times the bankfull depth.
    - High water table area = wetlands, seasonally saturated soils, standing water, seeps, bogs, etc.
- Trees in riparian buffers that need to be cut to facilitate harvest operations should be dropped into the stream if possible and left to aid in wood recruitment (LRMP FW-197).

Water Quality

- Water Quality - In cooperation with the State of Oregon, the Forest shall use the following process:
    1. Select and design BMPs based on site-specific conditions, technical and economic feasibility, and water quality standards for those waters potentially impacted.
    2. Implement and enforce BMPs (USDA Forest Service 1988).
    3. Monitor BMPs to ensure correct application and effectiveness as designed in attaining water quality standards.
    4. Mitigate to minimize impacts caused by activities when BMPs do not perform as expected.

5. Adjust BMPs when there is evidence that beneficial uses are not protected and water quality standards are not achieved. Evaluate the adequacy of water quality criteria for assuring protection of beneficial uses. Recommend adjustments to water quality standards as appropriate.

- To prevent water contamination, fuel and other petroleum products must be stored and refueling must occur at least 150 feet from any stream or other sensitive waterbodies.
- If the total oil or oil products storage at a worksite exceeds 1,320 gallons, or if a single container (i.e., fuel truck or trailer) exceeds a capacity of 660 gallons, the purchaser shall prepare and implement a Spill Prevention Control and Countermeasures (SPCC) Plan. The SPCC Plan will meet applicable EPA requirements (40 CFR 112); including certification by a registered professional engineer (LRMP FW-091, BMPs T-21, W-4, 8).

Coarse Woody Debris

- To the extent possible, avoid disturbance to the existing coarse woody concentrations during harvest operations (LRMP MA-15-16).
    - Ensure that existing snags 10 inches dbh or greater, and down logs 20 inches dbh or greater (which may occur in or adjacent to treatment areas) are protected to the greatest extent feasible during the proposed activity
- When it is feasible to do so, consider "high stumping" trees or snags 24 inches and larger in diameter during the falling of coarse woody debris. Creating stumps 3 to 6 feet in height would mitigate the loss of some existing roosting habitat more quickly than the delayed snag creation for bats and some existing perch, foraging, and potentially nesting habitat for land birds/neo-tropical migrants.

Logging Operations

- Inclusions within helicopter or skyline units suitable for ground-based logging systems would be logged using ground-based equipment. These areas are typically along existing roads, on ridgetops or benches adjacent to slope breaks where steeper topography begins, and are generally less than five acres in size. Similarly, areas that could be accessed with temporary roads and logged with skyline systems would be logged using a skyline system. Project implementation activities, including the logging feasibility report, unit layout, and sale administration will identify these areas.
- Landing and temporary road locations shown on the project planning maps and GIS layers are preliminary and approximate locations of the actual facilities that would be needed to log the proposed units. Actual locations are subject to agreement by the Forest Service and timber purchaser under the timber sale contract. All landings and temporary roads would comply with BMPs and programmatic consultation criteria. Any additional helicopter landings that require construction would be located in the flatter areas within units.
- Where cable yarding is planned, logging systems will be designed to yard away from stream channels to minimize soil disturbance in adjacent stream buffers (LRMP MA-15-27, BMP T-7).
- No landings would be used within 100 feet of a stream. If an existing landing within 200 feet of a stream is used, erosion control measures must be installed prior to use to prevent soil movement downslope from the landing. The landing must be rehabilitated (compacted soils fractured, seeded) after use. All new landings would be at least 200 feet from a stream.
- Landings planned for use between Oct 16 and May 14, must be surfaced with aggregate material.

- Skid trails must not be constructed through areas with a high water table, or be located in areas that will channel water onto unstable headwall areas.
- All skid roads (defined as more than five passes by a machine) used for ground-based operations will be designated on the ground to limit extent of soil compaction.
- Where practicable, ground-based machines will place logging slash on skid trails to create slash mats for machines to walk on. These mats act as a buffer for soils during logging.
- A harvester may be used for felling on slopes up to 45 percent on unbroken terrain, no closer than 100 feet from any stream channel, and will only be allowed a single trip there and back over a designated, slash-covered trail.
- Grapple piling would occur from roads only.
- Yarding corridors that cross stream channels would use full suspension within the no-cut buffers, and yarding corridors would not exceed 15 feet wide (LRMP MA-15-26,27, BMPs T-8, 12). Within the outer portion of the riparian reserve, full or one-end suspension would be required.
- Seasonal restriction would be imposed on all helicopter activity and other noise-generating activities associated with project activities during the spotted owl critical nesting period between March 1 and July 15. This restriction does not apply to ground-based activities such as falling, yarding, or hauling that are beyond 0.25 mile of suitable spotted owl habitat.

Soils

- Cumulative soil impacts of past and present roads, landings and skid trails shall not exceed 20 percent for each unit being thinned as part of this project (LRMP FW-081, 082, 083). The detrimental soil conditions potentially applicable to this planning area and the proposed management activities include compaction, soil puddling, displacement, and extent of the activity in the area. The units that may exceed 20 percent detrimental soil disturbance are: 1160, 1242, 1257, 1310, 1323, 1370, 1387, 1388, 1408, 1412, 1421, 1432, 1443, 1476, 1495, 1511, 1514, 1539, 1639, 1647, 1701, 3434, 4972, 10228, and 10307. These units will have all landings, temporary roads, and main skid trails ripped and seeded to return the area to pre-harvest conditions (see additional mitigations for soils in Appendix D).
- Log suspension requirements and fuel reduction operations are prescribed to minimize soil disturbance within FW-081 and FW-084 (from LRMP) limits. In the case where mineral soil is exposed in specific locations beyond the level of maximum allowable disturbance, the site would be waterbarred, seeded, and fertilized immediately following harvest.
- Apply Forest-approved grass seed to all bare mineral soil left after road decommissioning or road closure. Place laid-back sideslopes of fill removals, and apply coverage of native slash or weed-free straw to prevent surface erosion from direct raindrop impact during the first storms after fill removal (BMP R-5).
- Protect unstable areas identified by field visits in the early planning stages, as well as those identified during project implementation with adequate no-cut buffers (LRMP FW- 105, BMP T-6). Any additional unstable areas identified during project implementation will be protected with adequate buffers (LRMP FW- 105, BMP T-6). Unstable units identified are: 1242, 1257, 1323, 1364, 1378, 1421, 1446, 1523, 1538, 1539, 1566, 1658, 1679, and 3262.
- The following unstable slopes will be protected with a buffer of at least 100 feet wide from the edge of the unstable or sensitive area:

- areas adjacent to streams with indicators of active erosion such as ravel on the surface or jack-strawed trees),
- sensitive stream reaches (such as streams where the dominant channel substrate is sand),
- or channels with high residual impacts (i.e., bank erosion, downcutting, heavy fine sediment load).

Wildlife

Management Indicator Species

- For cavity excavators (including pileated woodpecker and marten): Retain existing snags and protect down logs to the greatest extent feasible as addressed in the silvicultural prescription.

Big Game

- Enhance openings associated with proposed activities such as landings, burn piles, soil treatment areas by applying approved forage seed mix and fertilizer.

Threatened, Endangered, and Sensitive Species

Northern Spotted Owls

(see logging operations)

Bald Eagle

- Ensure that potential bald eagle nest, roost, and perch trees (remnant overstory live trees and snags) are protected to the greatest extent feasible as documented in the project's silvicultural prescription are implemented as proposed.

Baird's Shrew and Pacific Shrew

- Ensure that riparian reserve buffers and variable density thinning component identified in the project's silvicultural prescription are implemented as proposed. This measure would provide refugia throughout areas affected by proposed activities and would mitigate negative effects to individuals that may be present and disturbed by such activities.

Pacific Fringe-tailed Bat

- In the event a significant bat roost is located within the project area, District or Forest wildlife biologist should be contacted to inspect the site, assess any project activities for their potential to impact bats, and implement recommendations to protect the site.

Oregon Slender Salamander

- Ensure that current snag, defective tree, and down wood habitat is protected to the greatest extent feasible during proposed activities as addressed in the project's silvicultural prescription. Also, ensure that future dead wood habitat is provided for as prescribed.

Cascade Torrent Salamander

- Ensure that riparian reserve buffers identified in the project's silvicultural prescription are implemented as proposed.

Fisheries

- Any in-stream activity such as culvert replacement occurring within fish bearing and other perennial streams will comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on in-stream work activities. For Fall Creek tributaries, in-stream work must occur between July 1 and October 15 unless otherwise approved by ODFW (BMP T-5).

Rare and Uncommon Botanical Species

- Known locations of the sensitive lichen *Usnea longissima* would be flagged prior to implementation. No thinning would occur within 170 feet of identified sites. If a known location is adjacent to a road, the protection buffer would extend only to the opposite roadside edge. Protection of *U. longissima* host trees would ensure propagule source for future establishment
- Known locations of *Peltigera pacifica* will be flagged prior to implementation. In order to facilitate project implementation various protection buffers were prescribed for *P. pacific*. Protection buffers for *P. pacifica* are as follows:
    - 170 foot full protection no cut buffer: sites CW14, CW6, CW7, MCR001, TEC06 and JC1
    - 50 foot protection no cut buffer: sites AH02, CW5, JC2, TEC 18, TEC25
    - 0 foot protection no cut buffer: sites CCS01, CCS02, CCS03, CCS04, AH09 and TEC15
- If sensitive plants are identified during implementation, the district botanist will be notified to determine if additional mitigation measures are necessary for the protection of a new occurrence.

Special Botanical Habitats

- Directionally fell trees away from identified special habitat to ensure minimal to no impacts from thinning activities.

Invasive Weeds

- Weeds populations classified as new invaders in the project area will be treated prior to harvest activities and follow all guidelines as outlined in the Willamette Integrated Weed Management EA.
- In areas where false brome (*Brachypodium sylvaticum*) exists in units and along roadsides adjacent to units a 50-foot no-cut buffer in addition to pretreatment will be required to contain the infestation and restrict the spread potential of this highly invasive weed.
- Pressure wash construction and logging equipment prior to entering the sale area. Areas designated for washing equipment prior to entry or after completion will be monitored for five years and will be treated if necessary following Willamette Invasive Weed EA guidelines.
- If specific units contains a high proportion of invasive weeds at time of implementation and pre-treatment is not possible, conduct thinning activities last in order to reduce propagule dispersal into non-infested areas.
- Obtain gravel for road construction and reconstruction from a weed-free rock source.
- 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.

- Treat and eradicate all noxious weeds along roads prior to closure.
- Berm, gate, or rip and seed any new roads and re-opened roads to reduce disturbance and incoming seed due to vehicular traffic.
- Implement Pacific Northwest Regional Invasive Plant Program (USDA 2005) prevention standards 3, 12, and 13 for use of certified weed free mulches, development of long-term site strategy for restoration and revegetation, and use of native plant materials for revegetation and restoration and rehabilitation.

Fuels

- Fuel treatments would reduce fine fuel loadings created from the commercial thinning. Fuel treatments include yarding tops and grapple piling and burning at landings, grapple piling within 40 feet of most roads left open, hand piling, and burning.

Air Quality

- Air quality would be maintained by adhering to the Oregon Smoke Management Plan and additional monitoring of low-level winds to insure that burning occurs when the risk of smoke intrusions into designated areas and Class I airsheds is low. Various fuel treatments methods such as yarding top, grapple piling along roads, and hand piling and burning, during spring-like conditions would be used. The slash piles would be covered and dry when burned which reduces the amount of smoke produced.

Cultural

- The 14 heritage resources within or immediately adjacent to treatment units would be flagged (with buffers applied). No trees would be harvested within 25 meters of a buffered site; felled trees would not fall into a site buffer; landings and staging areas should be located a minimum of 50 meters from buffered sites. Sites would be preserved in-place for future scientific study. Historic properties (sites eligible to the National Register of Historic Places or sites with undetermined eligibility status) would be monitored during or post-project activities, as determined by the Forest Archaeologist. It is further recommended that heritage resource site locations be provided to the sale administrator to ensure inadvertent effects do not occur.

Recreation and Public Access

- Logging activities and culvert removal near Winberry Campgrounds would be posted with signs and operations restricted during high use periods. Any road damage that occurs in the project boundary due to project implementation would be rehabilitated to the condition prior to the project implementation.
- All logging operations that involve helicopter yarding over main National Forest classified roads would require traffic flaggers for pubic safety. Disperse camping areas will be signed and restricted within flight path areas.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. The table should be used in conjunction with the discussion of issues in Chapter 3 – Environmental Consequences to fully understand the implications and differences of the alternatives.

Table 6. Comparison of alternatives

Project Features	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Acres of thinning	0	2,564	2,564
Harvest volume		40 MMBF	45 MMBF
Logging systems	0	ground-based, skyline, & helicopter	ground-based, skyline, & helicopter
Slash treatments (acres) Yarding tops Grapple piling along roads	0	 2,408 120	 2,092 40
Temporary Road construction (approximate miles)	0	4.5	4.5
Road reconstruction (miles)	0	44.8	39.7
Road maintenance (miles)	0	22.0	27.1
Road closure	0	All temporary roads used for harvest closed after project complete; 3.96 miles of existing roads closed	All temporary roads used for harvest closed after project complete
Proposed Open Road Miles	51.7	47.7	51.7
Proposed Closed Road Miles	15.1	19.1	15.1
Significant Issues			
Project cost (includes maintenance, construction & closures)	0	**$948,041**	**$889,178**
Gap Openings	NA	Gap openings up to 1 acre and covering up to 385 acres (15%) of treatment area	Same as Alt 2, but covering up to 513 acres (20%) of the treatment area
Open Road Density (miles/sq mi)	2.4	2.2	2.4

Monitoring

The following project-specific monitoring would occur:

- Field visits and verification that the proposed road closures occur and that the closures occur in a timely manner. Often road closures completed with KV funding occur well after project completion.
- Monitoring and field verification that road closures/decommissions are adequate to remove hydrologic connection of road drainage network to stream channels.
- Sites receiving a 0 and 50-foot no-cut buffer will be monitored one, two and five years after implementation for symptoms that might indicate loss of populations due to thinning.

Results of these monitoring tests could then be applied to future occurrences of *P. pacifica* in the forest.

- Annual invasive weed monitoring would be done for five years following treatments on all landings and areas where ground-disturbing activities have occurred.
- Recreation sites mentioned in this report monitored during project implementation to determine compliance with mitigation and determine if additional mitigations are needed.
- Heritage resource sites mentioned in this report monitored during project implementation to determine compliance with mitigation measures and determine if additional measures are needed.

Chapter 3. Environmental Consequences

Introduction

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.

The cumulative effects discussed in this chapter analyze and describe identifiable present effects of past and ongoing actions to natural and human resources acting additively together with the effects of Alternative 2 (proposed action) or Alternative 3. No foreseeable future actions are known at this time in the Winberry Creek drainage. There are several similar thinning projects planned in the Fall Creek watershed (see project listing in Appendix B). Individual effects of past actions have not been listed or analyzed and are not necessary to describe the cumulative effects of this proposal or alternatives (CEQ Memorandum, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005). A listing of all past and ongoing actions known of in the Winberry Creek watershed are in Appendix B.

Vegetation and Fuels

Methodology

Issues and Measurement Criteria

No key or substantive issues related to the objectives and methods of thinning to be used in this project were raised during the scoping period. Therefore, no specific measurement criteria are used to evaluate the thinning; rather the alternatives are evaluated in light of their effects on the progression of these stands towards late-seral structure, and on providing timber to the local economy.

The size of gaps employed in the “variable density thinning” was determined to be a key issue raised in scoping. Both alternatives limit the size of gaps to one acre or less. The measurement criterion for this issue is the percentage of the unit area allowed to be in gaps.

Cost associated with fuels treatments, especially in units that would be yarded with a helicopter, was identified as part of the key issue of project cost. The indicator for this issue is the number of acres of yarding tops in helicopter and skyline units. The economics report addresses the issue of fuels treatment costs in financial efficiency terms. Hazards related to increased fuel loads are considered in terms of the amount and location of areas that would remain above LRMP guidelines for fine fuels.

Forest structure and species composition were determined from walk-through examinations of stands, and from the stand exam data. From these, the project area was determined to be essentially even-aged Douglas-fir. Fire regimes are taken from the Lower Fall Creek Watershed Analysis. Fuel models (Anderson 1982) representative of the project area are based on field reconnaissance. The Westside Cascades Variant of the Forest Vegetation Simulator (FVS) (Donnelly and Johnson 1997) was used to simulate thinning. The Fire and Fuels Extension to FVS (FFE) was used to predict fuels loadings post-thinning.

Analysis Area

The analysis area and scale of analysis for cumulative effects was determined to be the Lower Fall Cr. watershed, representing approximately 14,000 acres and all seral stages of vegetation within that area. It was used to assess existing condition of seral stages. This area was delineated at a size to encompass the treatment areas and provide the appropriate size to reflect the measurement values where they become stable. It is large enough to determine the effects both spatially and temporally, relates well to cause-and-effect relationships of the treatments, is site specific to the location, and measures the change that is occurring to the stands.

Influences on Existing Condition

Timber Harvest

The analysis area was developed for timber production beginning in the 1950s. At that time, the development strategy was to build the long-term road system necessary for access to timber stands through the creation of 20- to 40-acre clearcuts spaced out along the road system ("staggered-setting" approach). This lead to the breaking up of large areas of contiguous mature and old forest into patches of mature/old forest with young stands interspersed throughout. At the time of cutting, these clearcuts created an "edge effect" on the older stands, by allowing light, heat, and wind to penetrate a certain distance (approximately 400 feet) into the timber. The edge effect affects species that thrive in interior forest conditions. Now that these plantations have reached a height of 100 feet or more, the edge effect has decreased.

Fire Suppression

Fire regimes within the project area are a combination of mixed-severity with stand-replacing fire (fire regimes 3B/3C), and infrequent high-severity fire (fire regime 5A). Stand-replacing fire events historically created large areas of young forest, which commonly exceeded 10,000 acres in size (Agee 1998). Given this type of disturbance pattern, the presence of dense young stands of Douglas-fir, such as found in this proposal, is not out of the historic norm, but the small size of patches in the project area and the uniformly dense stocking (as well as the general absence of large residual green trees and other legacies) is not considered to be representative of post-fire stands within the natural range of variation.

The fire regime condition class is best described by condition class 2, representing a moderate amount of departure from historic conditions. There is less departure in the higher elevation silver fir zone, where infrequent stand-replacing fire was the major disturbance. At lower elevations (western hemlock zone), there is likely more departure from historic conditions, since the hotter and drier summertime conditions would have lead to more ignitions from lightning and human sources. These more frequent fires indicate a mixed-severity regime with underburning, along with the creation of small to large patches of regenerating forest from stand-replacing fire.

Insects and Disease

The incidence of insects and disease within the project area is generally low and would be considered to be at endemic levels. Laminated root rot (*Phellinus weirrii*) is a primary disturbance agent, and the effect of this pathogen may have been increased due to the general lack of hardwoods (which are immune) becoming established in these dense plantations. The fungus creates openings in the stand, which typically become occupied by bigleaf maple, western hemlock, and western redcedar. These openings enhance stand diversity and wildlife

habitat and alter forest structure, composition, and succession. Gaps such as these are also considered a component of old-growth Douglas-fir forest structure.

Existing Condition

Forest Composition and Plant Associations

The project area is located within the Douglas-fir type, where Douglas-fir is the major early-seral tree species that establishes itself after a disturbance that removes most of the forest canopy. Most of the plantations in the project area are located in the western hemlock series, which is typified by moderate temperatures and ample moisture for tree growth, with most of the precipitation falling as rain or transient snow. These sites lie above the drier Douglas-fir and grand fir series, and below the cooler and more snow-dominated pacific silver fir series. Common understory trees are western hemlock, western redcedar, bigleaf maple, golden chinquapin, and Pacific yew. Common shrubs are dwarf Oregon grape, salal, vine maple, Pacific rhododendron, trailing blackberry, and prince's pine. Common herbs are swordfern, twinflower, trillium, vanilla leaf, and redwoods violet.

Forest Structure, Tree Size, Species Composition, and Density

The plantations proposed for commercial thinning were logged using the clearcut regeneration system from 35 to 60 years ago. After logging and burning the logging slash, they were generally planted to over 600 trees per acre of Douglas-fir. In some stands, naturally regenerated western hemlock and western redcedar comprise a large portion of the canopy, but most are dominated by uniformly dense Douglas-fir from about 10 inches to 24 inches dbh. Dominant Douglas-fir trees (those trees receiving direct sunlight from above) are commonly 16 to 20 inches dbh and 100 to 120 feet tall.

In order to better describe the stands and prescribe thinning treatments, they were stratified by age class and previous management activity (or lack thereof). This resulted in six strata. Table 7 presents the strata and the area that each represents. Stands that were previously thinned provide the most flexibility in terms of designing thinnings of various intensities to increase structural diversity. Conversely, stands without previous management would benefit the most from thinning, but thinning too heavily would put them at more risk from winter storm damage.

Table 7. Stratification of plantations proposed for thinning

Stratum	Description	Age (years)	Acres	% Project Area
1	Prior PCT and CT	40-50	67	3
2	Prior CT only	40-60	535	21
3	Prior PCT only	45-60	352	14
4	Prior PCT only	35-45	875	34
5	No Prior Thin	45-60	342	13
6	No Prior Thin	35-45	393	15
Total			2,564	100%

Notes: PCT-pre-commercially thinned; CT-commercially thinned

These young second-growth even-aged stands are in a stage of development classified as the "stem exclusion" stage according to Oliver and Larson (1990). In this stage, the trees have reoccupied all growing space and excluded new plants from becoming established. Variations in height growth have occurred to various degrees, with some trees expressing "dominance" over others to the point that many are overtopped, receiving no direct sunlight. Especially in

the stands that have not been previously thinned, or were only precommercially thinned, the ratio of tree height to tree diameter has become very large. This translates into small-diameter crowns that are also short, and stems that cannot support the weight of heavy snows that are typical in the western Cascades.

Stand density in all strata is currently at the point where inter-tree competition can be expected to lead to suppression-related mortality, and in fact, this mortality has been noted in several stands. Both relative density (RD) (Curtis 1982) and stand density index (SDI) (Reineke 1933) measures are above recommended stocking levels for optimizing individual tree and stand growth (see Table 8 and Table 9). Ideally, relative density would be in the 30 to 40 range, and percentage of maximum SDI would be in the 30 to 40 percent range.

Table 8. Stratum averages of stand parameters from stand exams (all values are for trees 7 in. dbh and larger)

Stratum	DBH	Trees/ Acre	Basal Area	SDI	% Max. SDI	RD	Canopy Cover
1	18.0	139	247	362	60%	58	68
2	15.2	200	247	392	65%	63	71
3	14.0	223	236	406	68%	63	69
4	13.1	266	247	411	69%	68	76
5	14.4	223	250	401	67%	66	65
6	12.9	261	235	394	66%	65	73

Notes: DBH-tree diameter at 4.5 ft. above ground; basal area-cross sectional area of trees computed at DBH; SDI-stand density index (Reineke 1933); RD - relative density (Curtis 1982)

Table 9. Density management regime for Douglas-fir in the Western Cascades

Mean DBH	LMZ-SDI	UMZ-SDI	TPA LMZ	TPA UMZ	BA/A LMZ	BA/A UMZ	RD LMZ	RD UMZ
4	180	300	718	1197	63	104	31	52
6	180	300	389	649	76	127	31	52
8	180	300	252	420	88	147	31	52
10	180	300	180	300	98	164	31	52
12	180	300	137	228	107	179	31	52
14	180	300	108	180	116	193	31	52
16	180	300	89	148	124	206	31	51
18	180	300	74	123	131	218	31	51
20	180	300	63	105	138	230	31	51
22	180	300	55	91	144	241	31	51
24	180	300	48	80	151	251	31	51
26	180	300	43	71	157	261	31	51
28	180	300	38	63	163	271	31	51
30	180	300	34	57	168	280	31	51

Max. SDI equals 600 (Coastal Douglas-fir, Long et al. 1988); Lower management zone (LMZ) = 30% max. SDI; Upper management zone (UMZ) = 50% of max. SDI
Normal BA equals 240 sq. ft. per acre based on ~55% of max. SDI BA
LMZ should approach ~60% of Normal BA as stands reach large sawtimber size

Fire Regimes/Expected Fire Behavior

Stands in the project area are dominated by Fuel Model 8: timber with understory and litter (Anderson 1982). Understory brush and litter-fall, as well as small trees where they exist, are the primary determinants of fire behavior in this type of stand. Given the high canopy density and the common occurrence of summer drought, stand-replacing fire is predicted to be the dominant type of fire that would occur from unplanned ignitions (professional judgment).

Fuels

Large heavily decayed logs from the original logging are common within the project area, similar to what is found in fire-regenerated stands that did not experience multiple burn events. Shrubs are generally low in stature and have low volatility. Overall, resistance to control would be considered low, although large logs could present an obstacle to fireline construction and mop-up in some areas.

Changes from Historic Conditions

Analysis of recent research suggests that there were historically several pathways of development of Douglas-fir stands leading to old-growth structure (Hunter 2001). Plantations found within the project area likely represent one pathway that occurred after wildfire whenever dense regeneration of Douglas-fir took place. However, the temporal and spatial aspects of the pathway represented by these plantations are thought not to have been the most common condition throughout the western Cascades (Tappeiner et al. 1997, Poage and Tappeiner 2002). Plantation stands are likely to develop on different and perhaps slower trajectories than those followed by existing late-successional forests.

Ecosystem Function and Resiliency

Live-crown ratios and height-to-diameter ratios in these young stands vary from conditions found in old-growth stands (Poage 2001). Crown ratios are a surrogate for tree vigor, and are typically 30 percent or less for young stands that have not been previously thinned, while old growth trees often have crown ratios greater than 50 percent. These young stands also typically have high height-to-diameter ratios, which make them susceptible to stem breakage from heavy snow loads, ice, and wind.

Forest Structure and Composition

Late-seral forest structure was estimated to cover 45 to 60 percent of the landscape in this area 200 years ago, while stem exclusion and understory reinitiation were 30 to 40 percent, and stand initiation was 10 to 15 percent. The amount of late seral forest has been reduced through timber harvesting, with a corresponding increase in the stem exclusion stage, which these plantations represent.

The majority of old-growth Douglas-fir stands in the Western Cascades appear to have regenerated following a massive fire disturbance episode around 1,500 AD that may have affected as much as two-thirds of the region (Franklin 2001). Based on this history, the above figures for seral stages would be for an “inter-fire” period when large-scale fires had been absent for several centuries. Apparently, amounts of older forest have also been drastically reduced in the past as a result of huge fires- the difference between these past events and the recent reduction due to timber harvest is in the spatial pattern of the harvest (small patch cuts) and the amount of biological legacies left after disturbance (fires generally left more legacies from the previous stand).

In the analysis area (14,035 acres) there appears to have been a pulse of stand origination 300 to 400 years ago, with another large stand-replacing event about 125 years ago. These older stands are found on about 7560 acres, or 55 percent of the area, with likely old-growth structure represented on 3,425 of these acres. Stands originating from clearcut regeneration harvest comprise approximately 5,800 acres (41 percent of analysis area), with 20 percent of these representing the stand-initiation stage, and 25 percent representing the stem-exclusion stage. There are approximately 360 acres of non-forest areas within the analysis area.

Large Trees

Many old-growth stands developed under low stem densities, which lead to consistently high growth rates of individual trees. Although old-growth stands and large trees still exist in the analysis area, trees larger than 32 inches in diameter are not as common on the landscape today as they once were. The uniformly dense plantations that are proposed for thinning, are not providing a pathway towards development of large-diameter trees with little inter-tree competition.

Tree Mortality, Snags and Down Wood

Dead trees in these plantations are generally small diameter (less than 20 inches dbh), without the large snags found in older stands. Mortality from competition, root disease, and storms is variable, and current snag densities (from stand exams) range from 0 to 30 per acre for small diameter (10 to 19 inches) snags, and 0 to 5 per acre for large diameter (20 inches and larger) snags. The average density for all plantations in the project is 4 per acre for small-diameter snags, and less than 1 per acre for large-diameter snags. Down wood data was not available for the project area, but fuels inventory plots in similar plantations in the Fall Creek watershed had an average of 12 tons per acre greater than 6 inches in diameter, and 35 tons per acre greater than 20 inches. These values were compared to DecAid for purposes of putting them into the context of the natural range of variability (see Wildlife Report).

Disturbance Processes and Patterns

Wildfire

Large stand-replacing fires were the primary genesis for most of the old-growth stands in the Western Cascades. Between the stand-replacement events, there are now thought to have been mixed-severity fires that may have contributed to lower stand densities. Young stands that developed after stand-replacing fires typically contained legacies from the previous stands in the form of large old trees, snags, and down logs. Subsequent mixed-severity fires may have contributed to the development of understory diversity.

Patch clearcutting of 20 to 40 acres began in Region 6 in the early 1950s. Between 1951 and 1981, approximately 1 million acres in the Western Cascades of Oregon and Washington were planted. These patch cuts did not emulate the larger patch sizes of the historic fire regimes, and until recently, did not retain large green trees and snags. The plantations resulting from this era are the types of stands proposed for thinning in this project.

Insects and Disease

Insects and diseases likely played a historic role of adding to stand diversity. Laminated root disease creates small openings, which tend to become occupied by hardwoods and hemlock/cedar. Douglas-fir beetles prefer to attack larger diameter trees that are wounded by

fire, or are blown down by wind. These processes would lead over time to more spatial heterogeneity in the stands.

Environmental Consequences

Alternative 1 - No Action

Direct Effects

There would be no direct effects to vegetation and fuels from the selection of the no action alternative because no treatments would occur.

Indirect Effects

Indirect effects of the no action alternative to vegetation and fuels would occur as these young stands remain growing at the high densities at which they were established to contribute to a high yield of timber products. As noted above (see Table 8), measures of stand density indicate that competition-related mortality is expected to increase as resources on the site become limiting. The current density also has lead to susceptibility to physical damage from winter storms, and this effect has been noted in some stands. These two factors in combination have the potential to lead to the development of high fuel loadings, increasing the hazard of stand-replacing fires, which would further exacerbate the age-class/seral stage gap in the project area with the loss of up to 60 years of growth on these plantations.

Without treatment now, many of these stands would likely eventually develop into the desired structure as natural disturbances and competition-related mortality open up the stand and trigger the understory re-initiation stage of development. However, it is expected that this process would take substantially longer than under the proposed thinning regimes (Bailey and Tappeiner 1998). Thinning now would also broaden future management options by removing hazardous fuels and creating stands more resilient to disturbances. This is especially true for the approximately 1900 acres in the project area that have not been previously commercially or pre-commercially thinned.

No action would forgo the opportunity to harvest approximately 40 million board feet of timber that would be produced from these thinning prescriptions. A large portion of this timber would be in the form of trees that would die in the future from inter-tree competition.

Alternatives 2 and 3

Both action alternatives would implement the same number of acres of thinning, using the same logging systems; they differ in the fuels treatment strategy and amount of gaps incorporated into the variable density thinning. The following points summarize the similarities and differences between Alternative 2 and Alternative 3 in terms of fuels treatments:

- Both alternatives would require yarding of tops in ground-based units
- Both alternatives would not require yarding tops in helicopter units
- Alternative 2 would require yarding of tops in all skyline units (with exception of several small/isolated units)
- Alternative 2 would allow for grapple piling from existing roads along all classified roads within units
- Alternative 3 would reduce the acres treated in skyline units- units located mainly on dead end spur roads would not require yarding tops

- Alternative 3 would allow for grapple piling from existing roads only along arterial and collector roads within units

Alternative 2 would allow gaps up to 1 acre in size, with one or more dominant trees or small groups of codominant trees left within the gaps, as well as hardwoods and shade-tolerant species. Alternative 2 would allow up to 385 acres (15 percent of the treatment area) in dominant tree release gaps. Alternative 3 would allow more gaps and some larger gaps by allowing up to 513 acres (20 percent of the area) in gaps and approximately 20 percent of those acres could be in gaps up to 3 acres in size.

Two significant issues related to vegetation and fuels were identified: size and area of gaps, and acres of tops yarded with skyline and helicopter-logging systems (related to cost of project). The alternatives will be compared in terms of these two issues, and in terms of how they address the purpose and need for the project.

Direct and Indirect Effects

Stand Structure and Development

This watershed has been altered by timber harvest over the last 50 years, resulting in an age-class distribution skewed towards the young and old ends of the spectrum. Thinning of the suitable young stands would not change the seral stage classification, but would help to close the gap in seral stages by pushing closed-canopy stands toward the understory-reinitiation stage where mature and late-successional characteristics start to develop. In effect, the stem exclusion- and understory-reinitiation stages of Oliver and Larson (1990), or analogously the biomass accumulation/competitive exclusion and maturation stages of Franklin et al. (2001) would be accelerated, leading to earlier appearance of old-growth structure. The thinning treatments are designed to facilitate development of structural conditions and components of late-successional forests: a variety of tree sizes (including large trees over 32 inches in diameter), horizontal variation in tree spacing, multiple layers, and an increase in species richness of trees, shrubs, and herbs.

Stand descriptors before and after thinning (from FVS model) are given in Table 10. Canopy cover in the moderate thinning is predicted to range from 43 to 50 percent after thinning, and is expected to be over 50 percent within five years. In the heavy thins, canopy cover is predicted to be about 35 percent, returning to levels of 40 percent or greater within 5 years. Recent thinning research in Douglas-fir plantations (see review of studies by Wilson and Puettmann 2007) has demonstrated a rapid response in canopy growth, especially in stands entered for thinning the second time.

The increase in average stand diameter reflects the method of thinning used, which removes primarily trees from the smaller diameter classes and subordinate crown classes (with the exception of hardwoods, western hemlock, and western redcedar). An effect of this is to promote large trees with a high growth potential to develop into the future upper canopy of an old-growth forest. Another effect is to reduce the average height-to-diameter ratios of the residual trees.

Moderate and light thinning treatments would reduce stand density to the lower end of the ranges described in Table 9. These numbers are only a guide, since the objective is to create a stand that is variable in density. They do indicate that, in general, the trees would fully occupy the site (outside of gaps), while individual tree and stand growth would be maintained at a high rate for at least several decades.

Table 10. Pre- and post-thinning stand descriptors (from FVS model)

Stratum	Thin Intensity	QMD_ Pre	QMD_ Post	BA_ Pre	BA_ Post	TPA_ Pre	TPA_ Post	RD_ Pre	RD_ Post	CC_ Pre	CC_ Post
1	MOD	18.0	22.1	247	144	139	60	58	31	68	45
2	HVY	15.9	19.5	240	109	174	51	60	25	67	35
2	LITE	16.1	18.3	240	160	170	84	60	37	71	56
2	MOD	14.7	17.5	252	125	217	76	66	30	73	47
3	MOD	14.3	16.1	236	120	215	84	63	30	68	43
4	HVY	13.9	16.7	233	80	222	53	62	20	68	36
4	MOD	12.9	15.3	251	117	280	94	70	30	78	50
5	MOD	14.4	17.9	250	127	223	73	66	30	66	43
6	LITE	12.6	14.1	240	160	278	146	68	43	72	60
6	MOD	13.1	15.5	222	117	241	96	61	30	70	49

QMD is average stand diameter; BA is basal area per acre in sq. ft.; TPA is trees per acre; RD is Curtis' Relative Density; CC is canopy cover, Pre is before thinning, Post is after thinning

Fire and Fuels

Currently, fuels profiles are dominated by fuel model 8, timber with understory and litter, with some areas represented by fuel model 10. Slow-burning ground fires with low flame lengths would be the typical case under normal conditions, with some flare-ups in areas of heavy fuel concentrations from mortality and storm damage. Under severe weather conditions, these stands would pose a hazard.

Following thinning, fuel model 11 (logging slash-partial cuts) would dominate. Fires would be expected to burn fairly actively in this untreated situation, with active torching and possibly crowning under higher wind speeds. The duration of this hazard is expected to be about 10 years, based on local experience with decomposition of fine fuels.

Alternative 3 represents a greater short-term fire hazard, since it would treat 315 acres less than Alternative 2 and total untreated area would be 735 acres, or about 29 percent of the thinned (project) area. However, in the design of Alternative 3 it was sought to reduce exposure of this hazard to firefighters by locating untreated units away from arterial and collector roads, away from private land along the National Forest boundary, and away from recreation traffic and infrastructure. With this in mind, the alternatives are similar in their effects related to road access for firefighters.

Effects Related to the Significant Issues

Acres of Yarding Tops on Helicopter and Skyline Units

Fuel loadings of fine fuels (less than 3 inches diameter) after thinning are predicted to range from 15 to 18 tons per acre (from FVS-FFE) for moderate thinning in the dominant strata. Fuel loadings would likely be less for light thinnings, and slightly more for heavy thinnings, depending on the number of stems removed to meet target residual density. In general, it is predicted that all thinning treatments would exceed the LRMP guideline of 7 to 11 tons per acre (does not have to be met on every acre). Yarding of tops would be expected to reduce fine fuels to within the LRMP guideline, except in the heavy thinnings. Alternative 2 would not require yarding of tops on 149 acres of helicopter units and 8 acres of skyline units. In addition, 263 acres of heavy thinning with yarding of tops would remain above guidelines, for a total of 420 acres that would remain above guidelines; this represents about 16 percent of the thinned area.

Alternative 3 increases the amount of untreated skyline ground by 315 acres for a total of 472 acres of no treatment. The addition of 263 acres of heavy thinning treated only by yarding tops would bring the total estimated area that would remain above the LRMP guidelines to 735 acres.

From the standpoint of treatment costs, there would be a savings on the 420 acres under Alternative 2 and 735 acres under Alternative 3 that are not treated to bring fuel loadings to within guidelines (see Economics Report). It should be noted that some of the acres of no treatment (no yarding of tops) would be treated by roadside grapple piling that would improve firefighter defensible space.

Area in Gaps

Gaps are small openings where all the trees are harvested, except one or more dominant trees may be left. Alternatives 2 and 3 vary in the amount of area that would be in created gaps. Alternative 2 would include up to 385 acres (15 percent of the treatment area) and Alternative 3 would harvest up to 513 acres (20 percent) of gaps, and 20 percent of these 513 acres could be up to 3 acres in size.

By increasing understory trees and shrubs and creating edge habitat, gaps in stands, have been shown to be beneficial to many songbirds, small mammals, and lichens. Creation of gaps would also be beneficial for big game forage by potentially promoting tall shrub browse species such as vine maple, bigleaf maple, and huckleberries. In a review of thinning studies, Wilson and Puetmann (2007) found gaps of 1 acre in size tended to display a shrub species shift, while smaller gaps (1/4 acre) did not, and the response was delayed due to mechanical damage from harvesting. While canopy closure and height growth surrounding gaps leads to a decrease in vigor of this tall shrub layer over time (5 to 10 years), it is expected that future thinning treatments and disturbances would promote these species as well, leading to a long-term increase versus unthinned stands. While not analyzed in these studies, gaps larger than 1 acre would be expected to allow these tall shrubs to persist longer than without treatment. Herbaceous cover, which is beneficial to many small mammals as well as big game, was not found to be as responsive to reductions in overstory canopy as shrub cover, likely due to shading by the increasing shrub layer as well as shade-tolerant conifers.

Alternative 3 would create gaps in up to 20 percent of total treatment acres, versus 15 percent under Alternative 2. Twenty percent of these gaps could be up to 3 acres in size, but actual size would depend on factors such as presence of secondary shade zones on perennial streams, presence of shade-tolerant trees and tall shrubs, logging systems, and other site-specific factors. Based on the review of recent studies discussed above, both action alternatives would increase short-term (less than 10 years) browse for big game. Alternative 3 would have a proportionally larger positive effect due to the increased area in gaps creation of a percentage of larger gaps. Long term, both alternatives would likely lead to the maintenance of browse species in the stands, which could be promoted by future thinning treatments and/or natural disturbances that open up the upper tree canopy.

Resilience to Fire and Other Environmental Variables

The thinning treatments under both action alternatives would reduce crown bulk density, raise the height to live crown, and increase average stand diameters. In terms of fire resiliency, all of these factors would make these stands more able to withstand the effects of a fire (Graham et al. 1999). Surface fuels in the form of shrub layers would increase, and dead and down fuels on the forest floor would increase even in units where tops are yarded and burned at the landing.

Opening up these stands would also increase potential wind speeds, which contribute to flame lengths. While there are always tradeoffs to stand manipulations in terms of fire behavior, it is expected that in the long term (10 years and beyond) the thinning conducted in this project would lead to reduced propensity towards crown fires and stand-replacing fire events. This conclusion is based on the expected rapid recovery of the upper canopy that would inhibit continued growth of tall shrubs that could contribute to extreme fire behavior. Also, the species of shrubs involved, namely vine maple, bigleaf maple, and red huckleberry, are not know for being particularly volatile during a fire. As mentioned above, units with no fuels treatment, and heavy thinnings would remain at a heightened hazard level for the short term. Areas in created gaps also may represent a heightened hazard level due to the likely persistence of tall shrubs and higher fuel loadings from treatment, but these should behave as "jackpots" within an otherwise low fire behavior matrix.

Thinning would improve the ability of these stands to withstand the typical winter wind, ice, and heavy snow storms in the Cascades, although there may be a short-term increase in susceptibility to wind storms in the denser stands on exposed sites. Over time, thinning promotes a lower height-to-diameter ratio, which improves the ability of a tree to withstand heavy snow and ice loads, especially if they are associated with dynamic loadings associated with high winds (Oliver and Larson 1990). Care was taken to design thinning intensity so that stands exposed to prevailing winds would not be opened up too fast too soon. However, some blow-down is still to be expected, and these events are expected to provide additional coarse woody debris and diversity to stands, while still maintaining an adequate growing stock for future management objectives.

Cumulative Effects

Alternative 1 – No Action

Within the analysis area, timber harvest and associated road construction have been the dominant management activities having a cumulative effect on vegetation. Regeneration harvest using the clearcut or clearcut with reserve trees systems has affected the distribution of development stages, which currently are 55 percent LOS (old-growth and understory reinitiation), 20 percent stand initiation, and 25 percent stem exclusion. The no action alternative would have no effect on the current distribution of these stages in the next 20 to 30 years. After 20 to 30 years, it is expected that many of the older plantation stands would begin to move into the understory reinitiation stage as a result of inter-tree competition and natural disturbances.

Alternatives 2 and 3

Past Actions and their Effect on Current Conditions - As mentioned above under Existing Condition, past timber harvest in these subdrainages has resulted in an altered distribution of development stages compared to 60 years ago, when active timber harvest began. Since these plantations were established through plantings with the objective of maximizing growth and yield of timber, they are now thought to not be representative of most natural stand development processes.

Contrasting Effects of Proposed Action with Past Actions - The proposed action differs from past actions, in that previous timber harvest (with the exception of some recent commercial thinnings) consisted of clearcut logging, broadcast burning, and planting with Douglas-fir seedlings. The actions proposed here are intermediate treatments that have the express intent of maintaining all management options for the future and of stimulating the development of late-

successional forest conditions that have become much less prevalent on the landscape. These treatments would move these stands along the pathway to understory reinitiation, but would not alter the current distribution of seral or development stages (also called structural stages) within the analysis area.

Effects of Ongoing and Reasonably Foreseeable Actions - Similar thinning projects are being carried out within the Fall Creek watershed (see project lists in Appendix B). These projects are nearly universally viewed as being a positive step towards restoring the forests of the Douglas-fir region to be more within the natural range of variability. No future projects in the analysis area are known at this time. However, potential foreseeable actions within the analysis area could include precommercial thinning in plantations in the stand initiation stage, having the objective of moving these stands more rapidly along the successional pathway towards older forest structure without changing the current distribution of stages.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions - In terms of past, proposed, ongoing, and foreseeable actions, this project would have no cumulative effects to the vegetation structural stages within the analysis area. The current distribution has been molded by past activities, which removed older forest types. This project would improve the distribution of structural stages over the long-term for species needing older forest habitat for part or all of their life cycle.

Air Quality

Introduction

Smoke contains pollutants including tiny particles called particulate matter (PM). Particulate matter can cause health problems, especially for people suffering from respiratory illness. Based on recent research, the Environmental Protection Agency revised the air quality standards to better protect health and visibility. Under the new standards, land managers must consider using techniques that minimize smoke emissions and impacts of smoke on public health and the environment.

This report will focus on the effects of the expected smoke production from fuels treatments associated with commercial thinning, and compliance with the Oregon Smoke Management Plan. All burning would consist of burning piles of tree tops and limbs, as well as occasionally large pieces of wood, at log landings and along roadsides.

Public issues often occur when meteorological conditions develop that are not conducive to dispersal of smoke from pile burning operations. All operations would be based on careful monitoring of weather conditions and forecasts, and would involve daily coordination with the State of Oregon Smoke Management Office in Salem.

Methodology

Issue and Measurement Criteria

Estimates of emissions produced by the action alternatives and from a wildfire are derived from modeling of similar thinning projects (Niner, Hehe projects) on the Middle Fork Ranger District using the CONSUME model. Estimates of PM 2.5 and PM 10 from the action alternatives and from a wildfire are given as an indicator of potential contributions to regional amounts of these pollutants.

Analysis Area

The project area is located within about 60 miles of three Class I airsheds: the Three Sisters Wilderness Area, the Waldo Lake Wilderness Area, and the Diamond Peak Wilderness Area, all located approximately 20 to 25 miles to the east. Eugene, Oregon is the closest designated area, located approximately 20 miles to the west. The Oakridge Special Protection Zone is approximately 20 miles to the east. Weather patterns are primarily influenced by Pacific Ocean fronts, which dominate from September to May and result in upslope winds from the southwest. During the summer months, the pattern can be either frontal off the Pacific, or it can be an offshore pattern (east wind) resulting from an interior high-pressure system in conjunction with a coastal low-pressure system. Temperature inversions are common during winter months when emissions can be trapped under a layer of cold surface air. During the summer, stagnant air masses can result from strong high-pressure systems that do not allow movement of pollutants out of the airshed.

Existing Condition

Oakridge, Oregon is a Special Protection Zone, by virtue of its historic problems with air quality. Temperature inversions, wood-burning stoves, sawmill residue burning (mill has since closed), and forestry burning all have contributed to this designation. Part of Lane County is an EPA non-attainment area for PM 10 as of March 2008.

The following passage regarding non-attainment areas and smoke from wildland burning is from Sandberg et al. (2002):

> Wildland fire in and near nonattainment areas will be scrutinized to a greater degree than in attainment areas and may be subject to general conformity rules. Extra planning, documentation, and careful scheduling of prescribed fires will likely be required to minimize smoke effects in the nonattainment area to the greatest extent possible. In some cases, the use of fire may not be possible if significant impacts to a nonattainment area are likely. The major pollutant of concern in smoke from fire is fine particulate matter, both PM10 and PM2.5. Studies indicate that 90 percent of all smoke particles emitted during wildland burning are PM10, and 90 percent of PM10 is PM2.5 (Ward and Hardy 1991). The most recent human health studies on the effects of particulate matter indicate that fine particles, especially PM2.5, are largely responsible for health effects including mortality, exacerbation of chronic disease, and increased hospital admissions (Dockery and others 1993; Schwartz and others 1996).

Environmental Consequences

Alternative 1 – No Action

Direct Effects

There would be no direct effects on air quality resulting from the no action alternative because proposed activities would not occur.

Indirect Effects

The fuels profiles would continue to develop towards Fuel Model 10 as these stands continue to self-thin and are affected by winter storms and root disease, increasing the hazard of mixed-severity and stand-replacing fire. Under extreme weather conditions there would be the threat of a large, uncontrolled release of smoke from a large wildfire (1,000 acres or more), and consumption would be higher due to lower fuel moistures than would occur under a controlled burn. Studies from the Columbia River Basin Analysis show that emissions from wildfires are 50 to 70 percent greater than prescribed burns, and the potential PM 10 is twice as great. Dense

smoke from a wildfire could flow into the Eugene Designated Area, Oakridge Special Protection Zone, and even into the Bend Designated Area. This smoke incursion would most likely happen during August through September, when conditions for smoke dispersal are typically the worst and when recreation visitation to the area is the highest. Table 11 provides an estimate of the amount of particulate that would be released in a 2500 acre wildfire in the untreated plantation timber type.

Alternatives 2 and 3

Direct Effects

Emissions estimates from burning of landing and roadside piles are found in Table 11. These emissions represent the potential PM 10 and PM 2.5 that could affect public health in designated areas and create haze and reduce visibility in Class I airsheds. All of this burning would not occur at once, and following the Oregon Smoke Management Plan guidelines would minimize these potential effects by controlling the total emissions to be commensurate with meteorological conditions and local weather and topography.

Table 11. Predicted emissions from burning (total tons)

Emission Type	Alternative 2	Alternative 3	Wildfire
PM 2.5	132	113	1,550
PM 10	156	134	1,650
Totals	288	247	3,200

Notes: Alternative 2 is based on 2,408 acres of yarding tops, and 120 acres of grapple piling along roads. Alternative 3 is based on 2,092 acres of yarding tops, and 40 acres of grapple piling along roads. Tops and grapple piles would be burned at the roadside. Wildfire emissions assume a late summer wildfire of approximately 2,500 acres.

Indirect Effects

The critical pollutants thought to affect humans include PM 10. These particulates, which are less than 10 microns in diameter, are able to travel through the nose and mouth and enter the upper airways starting with the windpipe. Due to its small size and weight, PM 10 can remain airborne for weeks. Over 90 percent of smoke particles are PM 10, and exposure to PM 10 irritates chronic respiratory diseases such as asthma, bronchitis, and emphysema. Again, following the Oregon Smoke Management Plan guidelines would minimize these potential effects by controlling the total emissions to be commensurate with meteorological conditions and local weather and topography.

A potential wildfire on 2,500 acres would release over 10 times the particulates of the pile burning proposed under this project. An increased hazard due to logging slash is expected to persist for 5 to 10 years

Cumulative Effects

No long-term cumulative effects on air quality are anticipated due to the burning associated with this project. In order to protect air quality, the Oregon Smoke Management Plan instructions would be strictly adhered to.

All pile burning would be completed within two years of harvest (conditions permitting), and would create far fewer emissions than a wildfire occurring in an area of equivalent size. The Middle Fork District's fire management strategy for prescribed burning is to avoid large, uncontrolled releases of smoke such as are produced during a large wildfire. By burning slash 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 far fewer than emissions caused by wildfires during the pre-suppression, natural fire regime. Approximately 5,000 acres are burned annually on the 750,000 acres of the Middle Fork District under the natural fire regime (150-year return interval). Since 1991, the district conducts prescribed burns (pile burning, underburning) on about 1,000 acres annually. During the era of fire suppression when managers began maintaining thorough fire records (1970-present), wildfires burned only about 1,050 acres annually. This indicates that the combined total, annual acreage of wildfires and prescribed fires on the district is now far less than burned under the natural regime (2,050 acres annually vs. 5,000 acres annually). Wildfires typically occur during conditions of hot, stagnant air with often very poor smoke dispersal, whereas prescribed burning would be carried out when conditions for dispersal, dilution, and mixing are generally optimal.

No new, foreseeable future thinning projects are known at this time. The Niner and Hehe Projects are both similar in scope to this project. It is unlikely that these projects would conduct prescribed burning at the same time or during fuel treatments for this project. If, due to limited burn periods, the timing of burning for any of these projects coincided, air quality restrictions would limit the amount of burning that could occur, and therefore, prevent adverse cumulative effects.

Roads

Existing Condition

This planning area contains 97.1 miles of classified road, including 22.5 miles of collector road (main haul routes in and outside the project area) and 74.6 miles of local roads. Of this, 66.8 miles of classified road would be used during this project. About 9.4 miles are asphalt surfaced, 75.5 miles are surfaced with crushed aggregate, 7.1 miles have a native pit run surface, and 5.1 miles are native surfaced. There are 30.3 miles of road within the planning area that do not access harvest units or are not used as haul routes. These roads are not scheduled for maintenance or reconstruction and will not be discussed further in this analysis.

The road density of all classified roads (open and closed) in the planning area is 4.1 miles/square mile. There are 51.7 open road miles in the project area and 15.1 miles of closed roads. Closures include both active closure by the district and roads that have closed due to blow down, road failure and/or disuse.

Road 1802 is the major east west corridor in this drainage. Road 1802, Lane County portion, is a double lane, paved road used year round for recreation (moderate use in the summer season) and provides access to private residences immediately west of this project area and to a large private timber tract adjacent to the west project boundary. The Forest Service portion of road 1802 is both single lane paved with turnouts for 4.5 miles and single lane gravel with turnouts for 7.68 miles. In addition, road 1802 is the major haul route for commercial thinning and other commodity extraction activities that occur in the watershed. Many of the culverts on this road were replaced during recent timber sales, but some were not replaced and now need to be replaced because they have exceeded their design life, which is displayed by rusting out, separating or leaking water out of the pipe. Of particular concern are the crossings at Brush Creek and Traverse Creek. Both of these sites are in perennial streams and have exceeded their design life.

- Road 1816 was recently reconstructed on the Fall Creek side, but no work has been done in recent years on the portion within the Traverse Creek Thin planning area. The

culverts on this road are in very poor condition. Numerous ditch relief culverts need to be replaced as well as three culverts in intermittent streams.

- Roads 1821 and 1824 are in better condition then road 1816, but still need replacement of ditch relief culverts and culverts in intermittent streams.
- The portion of the 1802150 road that is used for this project is a single lane paved road with turnouts. This road is in good condition and will only require minor roadside brushing for safe use.

Environmental Consequences

Issue and Measurement Criteria

There is a concern that costs associated with project implementation could be prohibitively high. High project costs could suppress bid prices or discourage some potential bidders. Costs of concern include road construction, reconstruction, and closures, in addition to slash treatments, and logging requirements. Measurement criteria related to road costs include:

- Miles and cost of temporary road construction
- Miles and cost of road maintenance
- Miles and cost of road reconstruction
- Number and type of road closures

Alternative 1

Direct, Indirect and Cumulative Effects

Under this alternative, project activities, including all road-related activities would not occur. Therefore, there would not be any direct effects.

The current road system was built to access timber and other forest resources. Timber sale revenues paid for the majority of past construction and road maintenance. However, timber harvest has declined with the current shift toward ecosystem management. The change in forest management has seriously reduced the operating budget and the ability to maintain such an extensive road system. A consequence is that most roads are no longer annually inspected for maintenance requirements and deficiencies are not corrected and could result in extensive resource damage. Some roads may need to be removed from the system, others closed until future access is needed, and many roads are managed at the lowest possible maintenance level.

Open Road Density: Alternative 1 would not change the open road density since the project would not take place.

Alternatives 2 and 3

Direct and Indirect Effects

There are about 15.14 miles of existing closed roads within the project area. There are 51.7 open road miles. Each action alternative would be opening some of these currently closed roads to access timber stands for thinning. Roads opened would then be closed or decommissioned to a hydrologically stable condition.

Alternative 2 would decrease open road miles and increase closed road miles by 4.0 miles. Alternative 3 would not change the existing amount of open and closed road miles (Table 5).

Alternative 1, the no action alternative would not change the open road density since the project would not take place. Alternative 2 would reduce the open density to 2.2 miles/square mile since it would close an additional 4.0 miles. Alternative 3 would be the same as Alternative 1, since no additional miles would be closed.

The roads that would remain open for long-term use would be upgraded to meet standards and guidelines and to meet the Aquatic Conservation Strategy Objectives set forth in the Northwest Forest Plan. All reconstruction and maintenance work would meet project mitigation, BMPs and Design Criteria as listed on page 24.

The tables below summarize cost for all road work and haul collections. The miles of closure differ from the summary table on page 23 because of currently closed roads that will be opened and then closed again after thinning operations are completed. For road details, see Table 8 in the Roads Report. Estimates are based on projects completed in the past 3 years. No inflation factor is applied.

Alternative 2 is designed to provide a high level of public access to the area. This alternative would implement only some of the proposed road closure in the Middle Fork District Supplemental Road Analysis. Most road closures would be of low cost and low intensity designs to store the roads in a hydrologically stable condition, but would allow for easy reopening. There would be about 4.5 miles of temporary road construction, and maintenance and/or reconstruction of 66.8 miles of haul route roads.

Alternative 3 is designed to be the least cost by reducing road reconstruction costs and eliminating additional road closure costs. There would still be about 4.5 miles of temporary road construction, and 66.8 miles of maintenance and/or reconstruction, however there would be about 12.7 miles more of road maintenance and therefore less reconstruction, which costs substantially more per mile than maintenance.

Both of the action alternatives would repair the Brush Creek crossings, removing and replacing the existing three-barrel configuration with a large single barrel crossing that would provide fish passage. Both would also remove and replace the 60-inch culvert at Traverse Creek.

Open Road Density: Alternative 2 would reduce the open density from 2.4 to 2.2 miles/square mile since it would close an additional 3.96 miles. Alternative 3 would be the same as Alternative 1 (no change from current), since no additional miles would be closed.

Cumulative Effects

Since Alternative 2 reduces open road density, the overall access in the Winberry Creek subwatershed would be reduced slightly. This reduction would have benefits to some resources in the watershed: those are discussed in the wildlife, soils, and aquatics analysis sections. There would be no change in access in Alternatives 1 and 3.

Table 12. Transportation cost summary Alternative 2

Reconstruction Levels	**$/Mile**	**Miles**	**Total**
Low	$9,518	38.69	$368,251
Moderate	$21,670	4.00	$86,680
High	$180,300	2.08	$375,024*
Subtotal		44.77	$829,955
Maintenance	**$/Mile**	**Miles**	**Total**
Purchaser Maintenance	$1,200	22.03	$26,436
Total		**66.80**	**$856,391**
Maintenance Collections	**$/MBF**	**MBF**	**Total**
	$20	2,800	$56,000
Maintenance/Reconstruction Total			**$912,391**
Temporary Roads			
Construction	$2,500	4.50	$11,250
Closure	$1,750	4.50	$7,875
Subtotal			$19,125
Closure Levels	**$/Mile**	**Miles**	**Total**
Low	$3,500	3.55	$12,425
Moderate	$10,000	0.41	$4,100
Total Closure Costs			$16,525
Alternative 2 Total			**$948,041**

* Cost is derived from 2 Major culvert replacements, fish passage replacement at Brush Creek and Culvert replacement at Traverse Creek.

Table 13. Transportation cost summary, Alternative 3

Maintenance/Reconstruction Levels	**$/Mile**	**Miles**	**Total**
Low	$9,518	33.60	$319,805
Moderate	$21,670	4.00	$86,680
High	$180,300	2.08	*$375,024
Subtotal		39.68	$781,509
Purchaser Maintenance	$1,200	27.12	$32,544
Total		**66.80**	**$814,053**
Maintenance Collections	**$/MBF**	**MBF**	**Total**
	$20	2,800	$56,000
Maintenance/Reconstruction Total			**$870,053**
Temporary Roads			
Construction	$2,500	4.50	$11,250
Closure	$1,750	4.50	$7,875
Subtotal			$19,125
Closure Levels	**$/Mile**	**Miles**	**Total**
Low	NO ADDITIONAL MILES WILL BE CLOSED IN ALTERNATIVE 3		
Moderate			
Decommission			
Total Closure Costs			
Alternative 3 Total			**$889,178**

* Cost is derived from two major culvert replacements, fish passage replacement at Brush Creek and Culvert replacement at Traverse Creek.

Wildlife

Introduction

This section addresses potential effects of the project to proposed, threatened, endangered or sensitive (TES) fauna (USDA Forest Service 2004) that have been documented or have suspected occurrences on the Willamette National Forest. This evaluation is required by the Interagency Cooperative Regulations (Federal Register, January 4, 1978), to be compliant with the provisions of the Endangered Species Act (ESA) of 1973, P.L. 93-205 (87Stat. 884), as amended. The existing condition is described for each species, group of species, or habitat. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Past management actions related to timber harvest activity are generally responsible for the current condition of habitat for wildlife throughout the planning area. This is especially true in the proposed treatment units that are second growth plantations. These past actions have affected the overall amount and distribution of habitat for wildlife species by reducing the amount of old-growth habitat and increasing the amount of seral-forested environment. There are no foreseeable Forest Service actions planned at this time that would affect habitat in the Winberry Creek drainage. Past, present and foreseeable future actions can be reviewed in Appendix B of this EA. The summary of past, present and foreseeable future actions can be applied to the cumulative effects discussions for all species discussed in this section and will not be repeated for individual species.

Management of the planning area under the Willamette LRMP as amended should provide a long-term increasing trend in amount and distribution of habitat capable of providing for the ecological requirements for most species discussed. Cumulative effects from the Traverse Creek Thin Project in conjunction with past actions should be positive as overall biodiversity increases in response to the silvicultural treatments proposed within the planning area. Cumulative effects of species for which the long-term ecological trends may not be considered beneficial, will be discussed in more detail in that species cumulative effects section. Any effect is considered equal under either action alternative.

Methodology

Five different scales of analysis are used in this section to analyze the effects of the treatment activities on wildlife (see Figure 6).

The five analysis areas are:

- Traverse Creek Thin Project Area at 14,037 acres, referred to in this document as the “project area”.
- Traverse Creek Northern spotted owl habitat analysis area of 25,216 acres.
- Brush Creek (moderate)(winter range only), North Fork Winberry (moderate)(winter and summer range) and Lower South Fork Winberry/Monterica (low) (winter range only) Big Game Management Areas
- One 6th-level subwatershed, Winberry (31,419 acres)
- One 5th-level watershed, Fall Creek (123,639 acres)

The Willamette National Forest manages 72 percent of the federal lands in the Winberry Creek 6th-level hydrologic unit, and 76.5 percent in the Fall Creek 5th-level hydrologic unit.

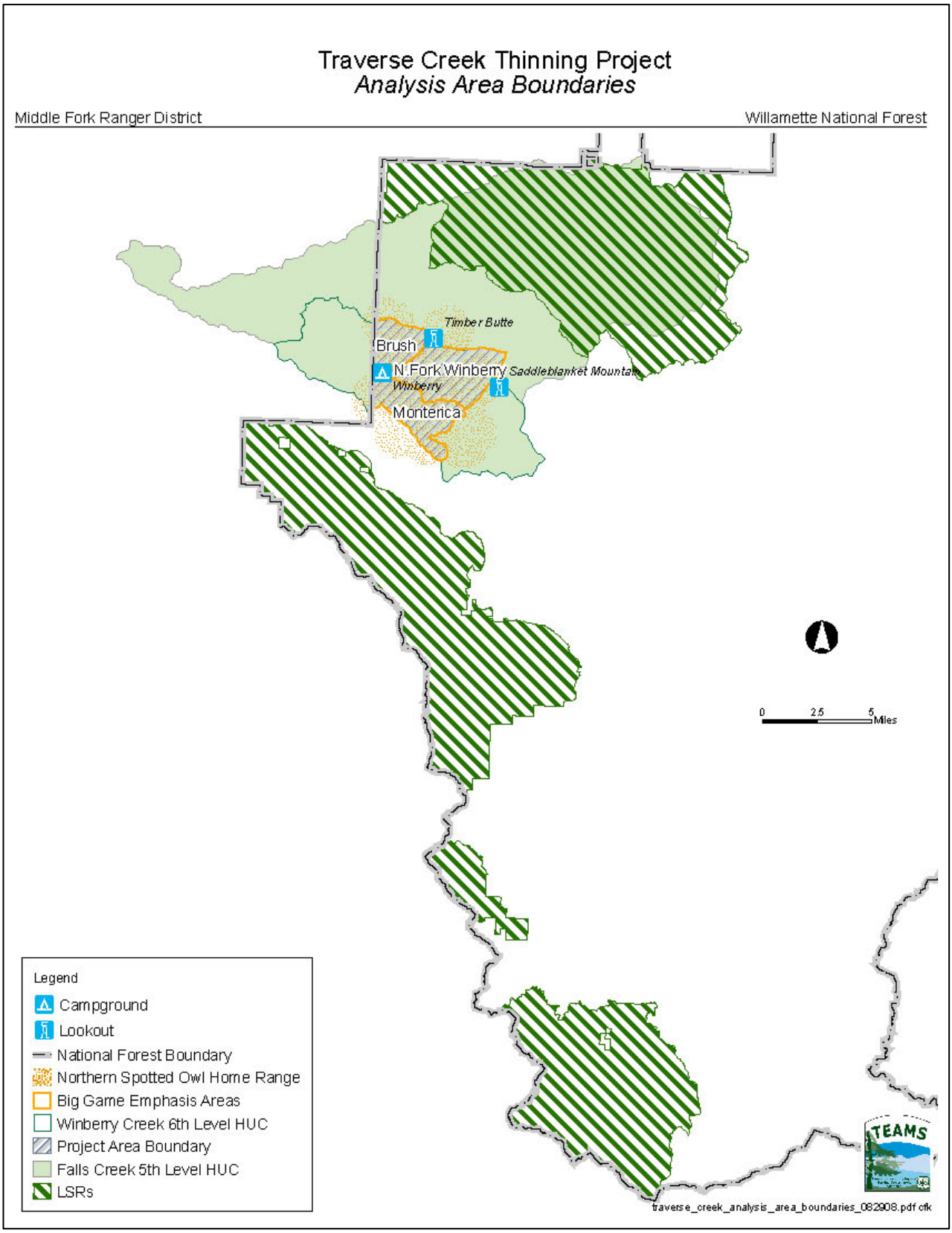

Figure 6. Map showing different analysis areas used for effects analysis. LSRs = late-successional reserves.

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, and non-Forest Service databases. Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (Baydack et al. 1999).

See the Vegetation and Fuels section above for a description of vegetation analysis and estimates of stand conditions. This data provided information for snag densities, big game cover, biophysical environment, and structural stages. Field reconnaissance information, aerial photos, and geographic information system (GIS) databases provided additional information.

Effects on species will be determined by assessing how alternatives affect the structure and function of vegetation relative to current and historical distributions. Some wildlife habitats require a detailed analysis and discussion to determine potential effects on a particular species. Other habitats may either not be impacted or are impacted at a level which does not influence the species or their occurrence. The level of analysis depends on the existing habitat conditions, the magnitude and intensity of the proposed actions, and the risk to the resources.

Elk habitat was evaluated using the Habitat Effectiveness Index (HEI) (Thomas et al. 1988), marginal and satisfactory cover percentages, and open road densities. Cover acres were obtained from Forest GIS databases. Open road densities were calculated using the District access travel management database.

Specific analysis methods used to evaluate alternative effects on dead wood habitats will be discussed under the Primary Cavity Excavators section.

Landbirds, including neotropical migratory birds (NTMB), were analyzed based on high priority habitats identified in the Oregon-Washington Chapter of Partners in Flight, Northern Rocky Mountains Bird Conservation Plan (Altman 2000). Much of the data for the Willamette National Forest was obtained from local biologists. Based on a review of the District's wildlife database, there is a high confidence level that species discussed in this report are currently present in the area.

Cumulative effects analyzed with respect to past, and ongoing activities are listed in Appendix B. At this time there are no known foreseeable future actions on National Forest lands in the Winberry Creek drainage. These effects were first analyzed within the context of the project area. If there were no contributions to negative or positive cumulative effects at that scale, then no further analysis was conducted. If there were contributions to effects at that scale, then the analysis scale was broadened to a larger land base scale, usually the subwatershed level. Analysis area size varied by species; the specific area used is documented in each wildlife section.

Dead Wood Habitats

Existing Condition

Dead wood includes standing dead trees (snags) and down wood (logs). It plays an important role in overall ecosystem health, soil productivity and numerous species' habitat. Bird and mammal species rely on dead wood for dens, nests, resting, roosting, and/or feeding on animals and organisms that use dead wood for all or parts of their life cycle. Dead wood comes in all

sizes (diameters) and species and goes through a decay process from hard to soft, ultimately ending up on the ground and turning into soil organic matter.

Snags

Current snag estimates were based on data obtained from stand exams and field reconnaissance, as well as Geographic Information System (GIS) databases. The Fall Creek Watershed Analysis (USDA Forest Service 1996) did an analysis of estimated snag levels within the 5th-level watershed as well as the various 6th-level sub-watersheds. This information was developed using local knowledge of stands in the watershed, past harvest history of managed stands, and recent wildlife tree retention requirements. The current estimated large snag level in the Lower Fall Creek subwatershed averages 1.7 snags per acre. The median large snag level for the entire Fall Creek watershed averages 2.06 snags per acre.

Any loss of existing snag habitat would be because individual snags are a safety issue and would be cut down under either action alternative. Estimates within the project area for current snag size and distribution are displayed below, and were made based on reasoned estimates from a combination of stand exam data, recognition of previous snag creation activity, and extensive field reconnaissance.

Within stand types proposed for thinning, the densities for 10- to 19-inch snags are as follows:

- Previously thinned managed stands: 4 per acre
- Un-thinned managed stands: 4 per acre
- All managed stands: 4 per acre

Large snags (20 in. and greater) average less than 1 per acre in all managed stands. The majority of snags are Douglas-fir. Snag distribution across the project area can be considered patchy and variable, and would be affected equally under either action alternative.

Under the silvicultural prescription for this project, green trees would be harvested from specified areas by variable density thinning. Following this prescription would result in a range of 55-100 trees per acre being retained, some of which may have defects that would provide a dead wood habitat component distributed throughout the project area – especially within riparian reserves. The silvicultural prescription also includes provisions for replacement of large snags at levels exceeding the anticipated average loss throughout the project area under either Action Alternative. The prescription entails creation of 2 snags greater than or equal to 20 inches dbh per acre where a deficit exists to mitigate snag loss from the proposed thinning and from past regeneration harvest, resulting in a stable or slight increase in large snag density over current conditions.

Down Wood

Down wood affords a diversity of habitat functions for wildlife including foraging sites, hiding and thermal cover, denning, nesting, travel corridors, and vantage points for predator avoidance.

No fixed area plots were located within the project area so down wood estimates for current size and distribution were made based on data obtained from 26 fixed area plots that sampled both unthinned and previously thinned managed stands throughout the Hehe planning area, located just to the north of the Traverse Creek planning area. The habitat type and landscape composition are similar in both project areas. Tree mortality largely associated with self-thinning competition, cull

logs from previous harvest activity and localized breakout from snow loading has resulted in down wood levels as follows:

- 12.3 tons/acre at least 6 inches or greater in diameter down wood in managed stands
- 34.9 tons/acre at least 20 inches or greater in diameter down wood in managed stands

Smaller logs are generally in decay class I and II, while larger logs are in decay class II and III. Many of the largest pieces of down wood (cull logs from initial harvest activity) exist in decay class III. Extensive field reconnaissance indicates existing down wood occurs in a patchy rather than even distribution across the planning area.

Environmental Consequences

Direct and Indirect Effects

No Action

The no action alternative would not remove any snags or downed logs therefore this alternative would have no effects on snag, down wood or cavity excavator habitat.

Action Alternatives

Under either action alternative, the Traverse Creek Thin Project proposes commercial thinning in approximately 18 percent of mid-seral (stem exclusion) habitat throughout the planning area. There is essentially no difference between action alternatives and their effect on dead wood.

The silvicultural prescription calls for protection of existing snags and down logs. However, some amount of loss or disturbance of snags and down wood is inevitable as a result of safety and logging feasibility issues. Mitigation measures including recruitment of sub-merchantable tops and debris not yarded to landings during commercial thinning, old stumps not included in the calculation of the down wood inventory, and some recruitment from retained trees would address this loss or disturbance. Effects analysis reveals that proposed activities in conjunction with mitigation measures would result in a stable or slight increase in dead wood levels associated with areas treated. Direct and indirect effects would be limited to an undeterminable number of snags and logs that may be unavoidably affected or created within harvest units.

Based on current stand structure, composition, and habitat type there is sufficient site-specific potential to support application of the Northwest Forest Plan Standard and Guideline (ROD page C-40) to leave an average of 240 linear feet of logs per acre greater than or equal to 20 inches in diameter across areas treated by the Traverse Creek Thin Project under either action alternative.

The number of small snags identified as a safety hazard to work areas that may be felled or that could be affected by pile burning is considered inconsequential relative to this type of habitat component in the surrounding landscape where fire is recognized as the major natural disturbance (Chappell et al. 2001).

Thinning activities proposed by this project include measures that maintain and protect habitat components important to support use by the group of cavity excavators listed as MIS. Implementing any of the action alternatives as proposed should have no direct or indirect effect on these species such that their ability to persist within the project area or throughout their ranges would be compromised.

Cumulative Effects

Past management actions related to timber harvest activity are generally responsible for the current condition of dead wood habitat throughout the planning area. These actions have affected the overall amount and distribution of dead wood habitat by reducing the amount of old-growth habitat and increasing the amount of mid-late seral habitat. There are no foreseeable actions that would affect dead wood habitat in this area. Current science and the changing trend in timber management that has occurred within the past decade, and projected for the future, should positively influence management of decaying wood as previously harvested stands are allowed to redevelop, and more emphasis is placed on retention of key structural components in unharvested stands.

Data analysis reveals the amount and distribution of snag and down wood habitat would essentially remain unchanged or experience a slight increase under either action alternative. Commercial thinning as proposed under either action alternative for the Traverse Creek Thin Project is therefore likely to have little or no cumulative effect on dead wood habitat throughout the planning area.

Dead wood habitat should exist in a sufficient amount and distribution to support the local wildlife community, including MIS such as pileated woodpecker, marten, and cavity nesters such that their ability to persist or become established would not be limited by this habitat component important to most members of the wildlife community in this area.

Current standards and guidelines governing management of this area provide direction that promotes long-term maintenance of amount and distribution of suitable habitat for this group of species. With respect to restoring historic habitat and biodiversity (by thinning the young dense plantations) that may benefit these species or their prey, project effects should result in a positive yet marginal overall contribution to cumulative effects that have occurred from past actions affecting the project area.

Threatened, Endangered and Sensitive Species Considered and Evaluated

Species that are not present and do not have habitat in the project area (“No” in “Habitat Present” column, Table 14) were not analyzed in detail. No endangered species are known to occur in the project area.

Table 14. Biological evaluation screening process for threatened, endangered, and sensitive species on the Willamette NF

Species	Habitat Present (B,R,F,D)*	Occupancy	Conflicts?	Determination Action Alts
Northern Spotted Owl *Strix occidentalis caurina*	B,R,F,D	Occupied	Potential Conflict	MANLAA
Northern Bald Eagle *Haliaeetus leucocephalus*	B,R,F	Unknown	No Conflict	NI
Least Bittern *Ixobrychus exilis*	No			
Bufflehead *Bucephala albeola*	No			
Harlequin Duck *Histrionicus histrionicus*	B,R,F,D	Unknown	No Conflict	NI
American Peregrine Falcon *Falcon peregrinus anatum*	F,D	Unknown	No Conflict	NI
Yellow Rail *Coturnicops noveboracensis*	No			
Black Swift *Cypseloides niger*	No			
Baird's Shrew *Sorex bairdii permiliensis*	B,R,F,D	Unknown	Potential Conflict	MIIH
Pacific Shrew *Sorex pacificus cascadensis*	B,R,F,D	Unknown	Potential Conflict	MIIH
Wolverine *Gulo gulo*	No			
Fisher *Martes pennanti*	B,R,F,D	Unknown	No Conflict	NI
Pacific Fringe-tailed Bat *M. thysanodes vespertinus*	R,F	Unknown	Potential Conflict	MIIH
OR Slender Salamander *Batrachoseps wrighti*	B,R,F,D	Unknown	Potential Conflict	MIIH
CascadeTorrent Salamander *Rhyacotriton cascadae*	B,R,F,D	Unknown	No Conflict	NI
FoothillYellow-legged Frog *Rana boylii*	No			
Oregon Spotted Frog *Rana pretiosa*	No			
Northwestern Pond Turtle *C. marmorata marmorata*	No			
Mardon Skipper *Polites mardon*	No			
Crater Lake Tightcoil *Pristiloma arcticum crateris*	B,R,F,D	Occupied	No Conflict	NI

* B = breeding (nesting/denning) habitat, R = roosting/cover habitat, F = foraging habitat, D = dispersal habitat

MANLAA = **M**ay **A**ffect, **N**ot **L**ikely to **A**dversely **A**ffect

NI = **N**o **I**mpact

MIIH = **M**ay **I**mpact **I**ndividuals or their **H**abitat, but the action will not likely contribute to a trend towards federal listing or loss of viability to the population or species

Threatened and Sensitive Species Determinations Summary

Table 15 summarizes effects determinations to species currently listed as threatened or sensitive deemed to have suitable habitat identified, and have either documented or suspected occurrence within the project area. Effects or impacts summarized are in reference to the proposed action. There are no recognized effects or impacts to these species from no action.

Table 15. Summary of threatened and sensitive species determinations

Species	Status	Alternative 1	Alternative 2	Alternative 3
Northern Spotted Owl *Strix occidentalis caurina*	Threatened	No Effect	MANLAA	MANLAA
Northern Bald Eagle *Haliaeetus leucocephalus*	Sensitive	No Impact	No Impact	No Impact
Harlequin Duck *Histrionicus histrionicus*	Sensitive	No Impact	No Impact	No Impact
American Peregrine Falcon *Falcon peregrinus anatum*	Sensitive	No Impact	No Impact	No Impact
Baird's Shrew *Sorex bairdii permiliensis*	Sensitive	No Impact	MIIH	MIIH
Pacific Shrew *Sorex pacificus cascadensis*	Sensitive	No Impact	MIIH	MIIH
Fisher *Martes pennanti*	Sensitive	No Impact	No Impact	No Impact
Pacific Fringe-tailed Bat *M. thysanodes vespertinus*	Sensitive	No Impact	MIIH	MIIH
OR Slender Salamander *Batrachoseps wrighti*	Sensitive	No Impact	MIIH	MIIH
CascadeTorrent Salamander *Rhyacotriton cascadae*	Sensitive	No Impact	No Impact	No Impact
Crater Lake Tightcoil *Pristiloma arcticum crateris*	Sensitive	No Impact	No Impact	No Impact

MANLAA = May Affect, Not Likely to Adversely Affect
MIIH = May Impact Individuals or Habitat

Threatened Species

The "Threatened and Sensitive Species" sections present brief descriptions of each species and their habitat, and then present the analyzed effects of all alternatives. The detail of analysis done supporting the predicted effects can be viewed in the appropriate species section of the wildlife report found in the project record.

Northern Spotted Owl (*Strix occidentalis caurina*)

Existing Condition

The spotted owl is a species strongly associated with old-growth forests containing a component of large-diameter Douglas-fir. These forest stands commonly provide a variety of structural features such as large-diameter trees having central cavities, dense canopies with a high level of vertical and horizontal diversity, and an abundance of snags and down logs (Thomas et al. 1990). Stands with all these characteristics provide the best suitable (nesting, roosting, foraging) habitat for spotted owls. Spotted owls have been known to forage short distances into harvested openings from a forested edge if a prey is available (Carey 2004).

Suitable habitat is generally defined as stands that have canopy closure exceeding 60 percent, are conifer-dominated, at least 80 years old and older, have multi-storied structure, and have sufficient snags and down wood that provide nesting, roosting, and foraging opportunities.

Dispersal habitat for spotted owls generally consists of mid-seral-stage stands between 40 and 80 years of age with canopy closures of 40 percent or greater and trees with a mean dbh of 11 inches or greater. Older stands lacking structural development that supports nesting may be considered dispersal habitat; however, on some occasions may provide roosting or foraging opportunities for the species. Spotted owls generally use dispersal habitat to move between blocks of suitable habitat or, for juveniles, to disperse from natal territories (Forsman et al. 2002).

In order to evaluate effects to spotted owls and their habitat from proposed activities associated with the Traverse Creek Thin Project, consideration needs to address an appropriate scale of analysis. Results from previous survey history for this area indicated 14 historic or occupied spotted owl activity centers. Collectively the Traverse Creek planning area plus the surrounding area associated with these home ranges defines the Traverse Creek Thin Project spotted owl habitat analysis area, which encompasses approximately 40,514 acres. This area is recognized for its current or potential ability to provide late-successional habitat connectivity between LSRs RO219, and RO222 along pathways that could include the Traverse Creek Thin project area (see Figure 6 above).

Within the analysis area, effects to spotted owls have been reviewed by focusing on habitat conditions at two scales. A landscape level analysis was conducted to assess habitat suitability and connectivity between LSR/CHU allocations along pathways that include the Traverse Creek Thin Project planning area. Analysis considered current and capable habitat conditions across the area in two contexts: 1) the condition of habitat in upland versus riparian reserve settings, and 2) the condition of habitat based on land management allocations designated as either “protected” or “unprotected” (see footnote in Table 16 for definition of these allocations).

Within the landscape level analysis area, habitat suitability in the home ranges for known owl pairs is also evaluated. This area includes a 1.2-mile radius traditional home range around spotted owl activity centers, and identified which activity centers could be affected by proposed restoration activities. The home range analysis provides data to compare the condition of occupied habitat surrounding the Traverse Creek Thin Project planning area against the condition of occupied habitat within the Willamette Province.

Table 16 and Table 17 list Northern spotted owl habitat and owl activity center conditions within the Traverse Creek Thin Project spotted owl analysis area. Spotted owl home ranges in the Willamette Province have typically been considered to incorporate a 1.2-mile radius around an owl activity center, with at least 40 percent of the area within the home range provides suitable habitat in order to support successful nesting. The 40 percent suitable owl habitat within 1.2 miles of an activity center was once considered a viability threshold. But along with suitable capability and protection status, it is now recognized as a measure of fitness for owls (Courtney et al. 2004).

Table 16. Status of NSO habitat within the Traverse Creek Thin Project spotted owl analysis area

	Total		Protected[1]		Unprotected[2]	
	Acres	% of Total	Total Acres	% of Total	Total Acres	% of Total
Acres within Boundary[3]	25,216	100	2,428	10	22,788	90
Suitable Habitat - Capable Acres[4]	15,018	59	281	2	14,737	98
Suitable Habitat - Current Acres	15,030	60	2,428	16	12,602	84

1 Acres in these columns are comprised of: Late Successional Reserves (LSR), 100-acre LSRs, Riparian Reserves, and District Designated Reserves. Spotted owl data are composed of LSR or designated wilderness areas only. These figures include those owl activity centers whose centers fall within the LSR or wilderness. The 1.2-mile radius surrounding the activity center may actually extend into unprotected areas.

2 Acres in these columns are comprised of: Matrix, Adaptive Management Areas, and Administratively Withdrawn Areas. Administratively Withdrawn Areas are included in the unprotected column because technically these areas are not designed to provide spotted owl habitat but rather to serve some other function such as "recreation and visual areas, back country, and other areas where management emphasis precludes scheduled timber harvest" (Northwest Forest Plan Record of Decision, Appendix A-4). The respective administrative land and resource management plans may protect and/or reduce the likelihood that spotted owl habitat located within Administratively Withdrawn Areas would be modified. Spotted owl data are composed of everything but LSR and designated wilderness data.

3 Acres include only federal lands.

4 Acres that are either currently suitable spotted owl habitat or have the potential to become suitable in the future. Suitable habitat is defined as nesting, roosting, and foraging habitat.

Table 17. Status of NSO activity centers within Traverse Creek Thin Project spotted owl analysis area

	Number of Activity Centers
Total spotted owl activity centers	14
Spotted owl activity centers >40%[1]	12
Spotted owl activity centers 30-40%[2]	0
Spotted owl activity centers <30%[3]	2

1 Spotted owl activity centers with greater than or equal to 1,182 acres of suitable habitat within a 1.2-mile radius.

2 Spotted owl activity centers that have between 886 and 1,182 acres of suitable habitat within a 1.2-mile radius.

3 Spotted owl activity centers with less than 886 acres of suitable habitat within a 1.2-mile radius.

When comparing the spotted owl and land classification data between the Traverse Creek Thin Project spotted owl analysis area and the Willamette Province, some fairly large differences emerge. For example:

- 37 percent of the habitat within the Traverse Creek analysis area boundary is currently suitable habitat compared to 19 percent within the Provincial boundary
- 98 percent of the Traverse Creek analysis area is capable of providing suitable habitat compared to the Willamette Province capability of 36 percent
- 100 percent of the spotted owl activity centers in the Traverse Creek analysis area fall within a protected land allocation compared to 41 percent for the Willamette Province
- overall, the capability of Federal land to provide suitable habitat within the Traverse Creek owl analysis area (98 percent) is considerably greater than the Willamette Province (84 percent) and elsewhere throughout the Northwest Forest Plan range of the spotted owl (74 percent) (Lint 2005)

Environmental Consequences

Direct, Indirect, and Cumulative Effects

No Action

Under the no action alternative, there would be no new management activities; therefore, there would be no direct, indirect, or cumulative effects to Northern spotted owl or their habitat.

Action Alternatives

Direct effects are the immediate consequences of the proposed action. A thinning treatment such as proposed by Traverse Creek Thin Project causes immediate modification of habitat. Indirect effects occur over time periods following implementation of activities associated with the project. The thinning treatment proposed by this project is based on the objective of increasing overall biodiversity throughout the planning area, and over time is expected to accelerate attainment of late-successional forest conditions. Direct effects are considered short-term (less than 10 years) in this context and are generally considered to range from adverse to none as described below applied to habitat modification, disturbance, and Critical Habitat. Indirect effects are considered long-term (generally greater than 10 years) in this context and are considered to range from none to beneficial for this proposed project.

Habitat Modification - Direct effects associated with habitat modification activities are considered as short-term, and summarized as follows:

- Dispersal habitat proposed for either light/moderate or heavy thinning amounts to 536 acres, and consists of habitat all in Matrix allocation
- Dispersal habitat removed (heavy thin): 252 acres downgraded (47 percent of dispersal thinned)
- Dispersal habitat maintained (light/moderate thin): 284 acres habitat maintained (53 percent of dispersal thinned)

Indirect effects associated with habitat modification activities are considered beneficial for spotted owls for the following reasons. Estimates of down wood size and distribution for the planning area when compared to DecAid data (Mellen et al. 2006) indicate conditions approaching the 50 percent tolerance level exist throughout the area. DecAid tolerance levels are used as a proxy for evaluating the guideline that states “habitat capability for primary cavity excavators shall be maintained to provide at least 40 percent or greater population potential at the subdrainage scale”. Data are limited, but suggests that dispersal habitat throughout the planning area is approaching suitability as foraging habitat. Implementing the silvicultural prescription as proposed should result in accelerating the transition from dispersal to foraging habitat as released trees respond by increasing size and structural diversity, and as additional levels of larger down wood continue to accumulate. Current suitable habitat should respond favorably to proposed thinning as structural diversity increases among younger live trees in stands where existing components such as large down wood, snags, and remnant overstory trees are protected. While these individual features will be protected, none of the treatment units are in older, more structurally complex multi-layered forests protected by Recovery Action 32 in the final spotted owl recovery plan (USDI Fish and Wildlife Service 2008).

Based on the silvicultural prescription and growth response projections, dispersal or suitable capability in thinned stands across the planning area should recover within approximately 10 years.

Disturbance - Direct effects associated with project activities that may result in disturbance to spotted owls are considered as short term. Any activity proposed by the Traverse Creek Thin Project resulting in disturbance between September 30 and March 1, or conducted beyond disturbance distances described in the Willamette National Forest Biological Assessment (BA) for Four Vegetation Management Projects (USDA Forest Service 2008), would have no effect on spotted owls.

Disturbance activities such as use of chainsaws, heavy equipment, and hauling associated with proposed thinning activities are considered to have a determination of "may affect, but is not likely to adversely affect" (MA-NLAA) spotted owls if conducted from July 15 – September 30 within the disturbance distances described in the Willamette National Forest Biological Assessment (BA) for Four Vegetation Management Projects (USDA Forest Service 2008). Helicopter yarding proposed under either Alternative 2 or 3 would also result in a MA-NLAA situation during this timeframe as long as the activity involved a Type I K-Max or any Type II-IV helicopter.

Indirect effects to spotted owls from disturbance associated with this thinning project may occur as a result of some related activities. Activities are associated with some mitigating measures and resource opportunity projects. Firewood cutting could result in disturbance if conducted within the defined disturbance distance during the spotted owl-breeding season (USDA Forest Service 2008). Related activities would not be conducted within the defined disruption distance during the breeding season.

Critical Habitat - Critical habitat is designated to provide for the conservation and eventual recovery of the species. The primary constituent elements of spotted owl critical habitat are those physical and biological habitat features that support nesting, roosting, foraging, and dispersal. There are no direct or indirect effects associated with habitat modification activities because under the new ruling by USFWS (released August 12, 2008) no critical habitat for the northern spotted owl exists in proposed treatment units or in the project area.

Cumulative Effects

Habitat Modification and Critical Habitat - Beyond the direct and indirect effects addressed associated with proposed activities under either action alternative, no future federal activities are reasonably certain to occur within the action area that would result in cumulative effects to spotted owl habitat – including critical habitat.

Current standards and guidelines governing management of this and surrounding areas provide direction that should provide for the long-term maintenance of amount and distribution of potentially suitable habitat for the spotted owl. The changing trend in forest management that has occurred within the past decade, and projected for the future, should positively influence occupancy of suitable habitat for the spotted owl as previously harvested stands redevelop and more emphasis is placed on recruitment of key structural components missing from harvested stands, retention of key structural components present in unharvested stands, and restoration/maintenance of special habitats as key components of biodiversity at a landscape level. The cumulative effect of the Traverse Creek Thin Project to habitat throughout the analysis area covering both the action area and planning area is considered positive in this regard.

Because of the present condition and location of current harvest and non-harvest allocations, cumulative effects of past or present actions such as the Traverse Creek Thin Project should not influence the ability of local populations to persist, or become established, by eliminating

demographic linkages beyond the species dispersal capabilities. There is no difference between action alternatives in the cumulative effect either may have on this species.

Determination

The analysis indicates the amount of current suitable spotted owl habitat, as a percent of the Traverse Creek Thin Project owl analysis area, is consistent with similar provincial and range-wide estimates. The analysis found the capability of Federal land to provide suitable habitat within the Traverse Creek Thin Project owl analysis area is considerably greater than elsewhere throughout Willamette Province or the Northwest Forest Plan range of the spotted owl. Current conditions in the Traverse Creek Thin Project spotted owl habitat analysis area are sufficient to support occupancy and dispersal of owls across the landscape, and should increase as capable habitat develops. The overall effect of this project on spotted owl habitat within the analysis area under either of the action alternatives would be 'may affect, not likely to adversely effect' due to insignificant and discountable short-term negative effects to habitat. The proposed thinnings have potential longer-term beneficial effects on habitat by creating faster growing trees with wider canopies.

The Traverse Creek Thin Project proposal does involve short-term degrading, downgrading, or removal of dispersal and suitable habitat in General Forest for the northern spotted owl. This habitat modification would also affect suitable and dispersal habitat within one or more spotted owl home ranges, and result in potential disturbance from the associated activities.

For Habitat Modification:

- Light/moderate or heavy thinning that maintains habitat or removes dispersal habitat **may affect, but is not likely to adversely affect** northern spotted owls.
- Individual tree removal in suitable habitat along haul routes **may affect, but is not likely to adversely affect** northern spotted owls**.**

For Disturbance:

- Activity conducted within the defined disturbance distance between July 15 and September 30 **may affect, but is not likely to adversely affect northern spotted owls.**

Sensitive Species

Bald Eagle (*Haliaeetus leucocephalus*)

Existing Condition

Throughout the Pacific Northwest, the bald eagle requires habitat containing large dominant trees in proximity to available food sources. Bald eagles forage widely during the non-nesting season, and though they do feed on carrion from small and large mammal carcasses, the majority of their food comes from animals associated with aquatic systems such as fish and waterfowl (Marshall et al. 2003).

Anthony et al. (1982) recorded that in the Pacific Recovery Area, resident bald eagle habitat requirements include a nest site in an uneven-aged (multi-storied) stand with old growth components. Nest trees are usually larger than those trees in the surrounding stands (USDA Forest Service 1990), primarily conifer (Anthony and Isaacs 1989), and have thick, stout limbs. The majority of nests in Oregon are located within 0.5 mile of a body of water. Forested land within 1.1 mile of some lakes, reservoirs, and rivers identified on the Willamette National Forest

can be considered potential bald eagle habitat (USDA Forest Service 1990). Bald eagles often construct alternate nests within a territory and vary use between them from year to year (USDI Fish and Wildlife Service 1986).

Concentrated northern bald eagle activity during the nesting season has not been observed within the project area. No surveys have been conducted within the project area. Occasional sightings of eagles roosting or foraging within this area have been reported by District employees and the general public. Most eagle observations are associated with areas along the Middle Fork of the Willamette River, south of the project area and around Dexter and Lookout reservoirs (west of the project area). The nearest known bald eagle nest site is located approximately 3 miles from the southern edge of the planning area in the Hampton area of Lookout Point Reservoir. No nesting activity is known to occur within the project area boundary.

Environmental Consequences

Direct and Indirect Effects

No Action - Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect, or cumulative effects to bald eagles or their habitat.

Action Alternatives - Both action alternatives propose commercial thinning in previously managed stands. No management activities are proposed that would affect nesting, roosting, or perch habitat in the project area. No direct effects to bald eagles are anticipated as a result of activities proposed under either action alternative associated with the Traverse Creek Thin Project.

Nesting, roosting, or perch habitat would likely improve as a result of this project's activities as maturing second growth stands respond to commercial thinning and silvicultural objectives such as increasing growth, vigor, and structural diversity are realized. However because the project area is not near large water bodies where they tend to nest these otherwise positive effects will likely have no effect. Indirect effects are considered equal between Alternative 2 and 3.

Cumulative Effects

Beyond the direct/indirect effects addressed associated with proposed activities under either action alternative, there are no Federal activities that are reasonably certain to occur within the planning area that would result in cumulative effects to habitat for bald eagle.

Determination

Neither the no action alternative nor the action alternatives are expected to measurably change bald eagle habitat; therefore, there will be **no impact (NI)** to bald eagles or their habitat.

Harlequin Duck (*Histrionicus histrionicus*)

Existing Condition

Harlequin ducks are classified as sea ducks, and spend a majority of their annual life cycle in rocky intertidal habitat foraging, loafing and roosting. However, the species is dependent on habitat associated with mountain streams for reproduction. Knowledge of specific habitat requirements of breeding harlequin ducks in the Pacific Northwest is based on a relatively small number of scientific studies of the species throughout the Region.

A study by Bruner (1997) of breeding harlequins in the central Cascade Range of Oregon has shown riparian habitat associated with 1st through 5th-order streams having mixed conifer and hardwood vegetation in a variety of seral stages to have a strong influence on nest site selection and reproductive success. Use of riparian and aquatic habitat for breeding, loafing and foraging was found to be most associated with low gradient, 3rd-order or greater streams with abundant instream rock and large woody material and overhanging streamside vegetation.

Harlequin duck sightings have been reported during the breeding season on all the Districts of the Willamette National Forest. No formal harlequin duck surveys have been conducted on the Middle Fork Ranger District. Records of sightings include pairs, singles, and females with young in Winberry Creek as well as adjacent or nearby watersheds such as Salmon Creek, Salt Creek, Hills Creek, Lower Middle Fork, and Fall Creek.

Previously harvested portions of riparian reserves are now generally providing closed canopy mid to late seral habitat, but lack structural components promoting biological diversity commonly associated with natural late seral and old-growth habitat. Cover such as large down logs associated with riparian habitat remains limiting in portions of previously managed areas. Vertical cover from riparian vegetation is generally abundant throughout the area. Both types of cover are known to be closely associated with harlequin duck nest sites in suitable habitat (Bruner 1997).

Environmental Consequences

Direct and Indirect Effects

No Action - Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to harlequin duck or their habitat.

Action Alternatives - No management activities are proposed that would modify or otherwise disturb breeding, loafing, foraging, or dispersal, habitat located in a limited portion of the planning area for harlequin ducks. Riparian Reserve buffers are designated to protect streams and adjacent habitat. No direct effects to this species are anticipated as a result of activities proposed under either action alternative associated with the Traverse Creek Thin Project.

The quality of suitable foraging habitat for harlequin ducks may improve as a result of this project's influence on upslope riparian habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity.

Cumulative Effects

Beyond the direct/indirect effects addressed associated with proposed activities under either action alternative, there are no Federal activities that are reasonably certain to occur within the planning area that would result in cumulative effects to habitat for harlequin ducks.

Cumulative effects from the Traverse Creek Thin Project should be positive on the limited amount of habitat in the planning area as overall biodiversity increases in and near areas responding to the silvicultural treatments proposed. These treatments should encourage a long-term increasing trend in the quality of riparian and/or aquatic habitat that may support harlequin ducks.

Determination

Neither the no action alternative nor the action alternatives are expected to measurably change harlequin ducks habitat; therefore, there will be **no impact (NI)** to harlequin ducks or their habitat.

American Peregrine Falcon (*Falco peregrinus anatum*)

Existing Condition

Peregrine falcon usually inhabit open country, preferably where there are rocky cliffs with ledges overlooking rivers, lakes or other open water and an abundance of birds. Nesting habitat includes cliffs or platforms near water and an abundance of prey. Peregrines are primarily aerial hunters; small to medium sized birds are usually captured in flight; birds too large to be carried are knocked to the ground. Peregrines feed on a wide variety of birds but they occasionally also take mammals, insects and fish.

There is no suitable peregrine nesting habitat in the planning area. In 1991, an aerial survey for peregrine nesting sites was conducted. One site with moderate potential for nesting was identified along Alpine Ridge. This site is adjacent to the project area and east of Saddleblanket Mountain Special Wildlife Habitat Area.

Adequate roosting habitat exists around Lookout Point and Fall Creek Reservoirs and the Middle Fork of the Willamette River. None of these areas would be affected by the implementation of this project. It is likely that on occasion areas within the planning area are used as foraging habitat by this species.

Environmental Consequences

Direct and Indirect Effects

No Action - Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to peregrine falcon or their habitat.

Action Alternatives - No management activities are proposed that would affect nesting habitat, nor influence foraging success or dispersal behavior in the planning area. No direct effects to peregrine falcons are anticipated as a result of activities proposed under either action alternative associated with the Traverse Creek Thin Project.

Foraging habitat for peregrines should likely improve as a result of this project's influence on habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity to the benefit of a variety of birds known to be preyed upon by peregrines.

Cumulative Effects

Beyond the direct/indirect effects addressed associated with proposed activities under either action alternative, there are no other known Federal activities that are reasonably certain to occur within the planning area that would result in cumulative effects to peregrine habitat.

The changing trend in timber and habitat management that has occurred within the past decade, and projected for the future, should positively influence successful utilization of foraging habitat for peregrines as more emphasis is placed on recruitment of key structural components missing from previously harvested stands, retention of key structural components present in unharvested

stands, treatment in riparian systems to promote structure, and restoration and maintenance of special habitats as key components of biodiversity at a landscape level.

Determination

Neither the no action alternative nor the action alternatives propose disturbance activities within a management area established for a known nest site, or propose activities that would otherwise affect the integrity of potential nesting habitat; therefore, there will be **no impact (NI)** to peregrine falcon or their habitat.

Baird's Shrew (*Sorex bairdii permiliensis*) & Pacific Shrew (*Sorex pacifius cascadensis*)

Existing Condition

Known habitat can briefly be described as conifer/mixed conifer forest stands, and other moist wooded or shaded riparian areas with numerous fallen decaying logs and brushy vegetation (NatureServe 2008, Verts and Carraway 1998).

Both of these *Sorex* species have documented occurrences on the Willamette NF in habitat similar to that associated with natural and older managed stands found throughout the Traverse Creek Thin project area. At least 38 specimens of *S. bairdi* are known to have been collected from sites in Lane County, most from locations on or near the Willamette National Forest (Verts and Carraway 1998). At least 65 specimens of *S. pacificus* are known to have been collected from sites in Lane County, most from locations on or near the Willamette National Forest including one location on the Middle Fork Ranger District (Verts and Carraway 1998). Based on life histories, documented occurrences and habitat associations, and locations of proposed thinning units, effects to these species from proposed activities are considered limited to within the project planning area.

Environmental Consequences

Direct and Indirect Effects

No Action - Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to Baird's or Pacific shrew or their habitat.

Action Alternatives - *S. bairdi* and *S. pacificus* can be affected under the action alternatives, by habitat modification activities such as falling and yarding – particularly when they occur adjacent to or within portions of Riparian Reserves. This could result in loss or displacement of individuals that may be occupying affected habitat during these activities.

Studies have shown that leaving even small no-harvest streamside buffers (9-67 m) is beneficial in maintaining riparian communities of small mammals at levels comparable to nearby undisturbed areas (Cross 1985, Anthony et al. 2003). The variable density thinning prescription proposed under either Traverse Creek Thin action alternative includes a no-harvest buffer in riparian habitat averaging 30 foot on either side of all streams, seeps, and springs. In addition, the prescription incorporates a strategy designed to promote down wood plus herbaceous and shrub cover, as well as provide patches of closed-canopy conditions. Such a prescription positively addresses finer-scale habitat features important to these shrew species, and has been considered to have the highest probability of maintaining the diversity of indigenous ground-dwelling vertebrates within a stand (Garman 2000).

Specific field surveys for *S. bairdi* and *S. pacificus* have not been conducted within the Traverse Creek Thin Project planning area. Garman (2000) analyzed survey data that documented the presence of these Sorex species during an intensive young stand study (YSS) on the Willamette National Forest.

Direct effects to these species are judged by the relative amount of habitat modified or disturbed against the amount available throughout the Traverse Creek Thin Project planning area. All natural stands, within the planning area would be unaffected by proposed thinning. Thinning activities are proposed in about would affect about 18 percent of the planning area. A variable density component to the silvicultural prescription, along with a riparian no-harvest buffer and a variety of seasonal restrictions would apply to either action alternative. Fire associated with fuels reduction (pile burning) would not occur within buffers established in riparian reserves. The anticipated scheduling of harvest activities over a period of about 2 to 5 years would further stagger modification or disturbance of habitat spatially and temporally across the planning area.

These measures would provide a level of spatial and seasonal refugia for individuals that may be exposed to direct effects from proposed activities. Nevertheless, this project would result in disturbance or modification of some habitat features known to be associated with use by *S. bairdi* and *S. pacificus*. Direct effects associated with thinning activities may therefore result in a short-term adverse effect to an undeterminable number of individuals.

Indirect effects associated with habitat modification activities are considered beneficial to *S. bairdi* and *S. pacificus* for the following reasons. Implementing the silvicultural prescription as proposed should result in accelerating the transition from managed stands in a structurally simplified mid-seral condition, to habitat having late-successional characteristics as released trees respond by increasing size and structural diversity, understory vegetation growth is stimulated, and as additional levels of larger down wood continue to accumulate. The developmental effects in riparian/upland ecotone habitat should be particularly beneficial to *S. bairdi* and *S. pacificus*.

There are no recognized indirect effects to these Sorex species related to disturbance associated with this thinning project as currently proposed.

Cumulative Effects

Beyond the direct and indirect effects addressed associated with proposed activities under either action alternative, there are no Federal activities that are reasonably certain to occur within the planning area that would result in cumulative effects to *S. bairdi* or *S. pacificus* from modification or consequential disturbance of habitat.

Determination

Habitat in natural stands throughout the planning area with highest potential to be occupied by *S. bairdi* or *S. pacificus* would not be modified or disturbed by Traverse Creek Thin Project activities. However, the potential for activities to modify or disturb potential breeding/denning, cover, or forage habitat, or disturb individuals that may be utilizing such habitat exists in about 18 percent of the planning area. Therefore it is determined that activities as proposed under either action alternative could result in a situation that **may impact individuals or their habitat, but the action will not likely contribute to a trend towards Federal listing** or loss of viability to the population or species (Baird's Shrew (*Sorex bairdi permiliensis*) and Pacific Shrew (*Sorex pacificus cascadensis*)). This potential impact to these two species is considered the same under either alternative.

Given current knowledge on the locations, ecological associations, and needs of these species it appears that maintaining or promoting biological diversity as proposed under the silvicultural prescription should assure the short-term and long-term availability of habitat suitable for use by *S. bairdi* and *S. pacificus* throughout the Traverse Creek Thin Project planning area.

Pacific Fisher (*Martes pennanti*)

Existing Condition

Pacific fisher is considered a riparian associate but found in a wide variety of densely forested habitats at low to mid-elevations. Its diet consists of small and medium-sized forest mammals (porcupines, snowshoe hares, tree squirrels, mice, and voles most common). They 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.

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 = 7.3mi^2 - 30.5mi^2 for adult male). Suitable spotted owl habitat displayed in Figure 6 for upland and riparian landscape settings can be referenced to provide a conservative example of suitable fisher resting and denning habitat within and surrounding the Traverse Creek Thin Project planning area. Between 1979 and 1999, nine unconfirmed fisher sightings were reported on the Middle Fork RD. Fisher presence has been confirmed within the past decade on the Diamond Lake RD/Umpqua NF.

There is no current confirmation that this species occupies habitat in the vicinity of the Traverse Creek Thin Project, however there is confirmation of fisher presence within the past decade at a location approximately 35 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.

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. 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 percent canopy closure are located throughout at least one third of 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.

Habitat associated with the Traverse Creek Thin Project currently considered being most capable of serving as breeding/denning, resting, foraging and dispersal habitat for fisher falls outside areas proposes for thinning activities. This particularly applies to habitat capable of providing denning and resting sites.

Environmental Consequences

Direct and Indirect Effects

No Action -Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to Pacific fisher or their habitat.

Action Alternatives - Effects to fisher from activities proposed under either Traverse Creek Thin Project action alternative are considered at the scale of the planning area, and are considered for the potential to modify habitat or otherwise disturb individuals that may occur in the area. There is no recognized difference between Alternative 2 or 3 with respect to any potential to affect this species.

Fisher are more likely to associate denning or resting activity in late successional or old-growth habitat found throughout the planning area than in previously harvested stands proposed for thinning activities. The silvicultural prescription provides measures for protecting key features of potential denning or resting habitat such as existing snags and large down logs. Traverse Creek Thin Project proposes no activity within thinning units (which represent about 18 percent of the planning area) that is considered to directly affect the ability of fisher to utilize habitat throughout the planning area for denning, resting, foraging, or dispersal.

Noise generating activities are considered to have some potential for disturbance to this species should it occur in close enough proximity. However, because of daily activity patterns, the wide-ranging daily movements of fisher, the low density of any potential population, plus the spatially and temporally dispersed aspect associated with activities across the planning area, disturbance potential is considered low. Any direct effects in this regard should not compromise the suitability of overall habitat throughout the planning area for use by fisher to any estimable extent.

Indirect effects associated with habitat modification activities are considered beneficial to fisher for the following reasons. Implementing the silvicultural prescription as proposed should result in accelerating the transition from managed stands in a structurally simplified mid-seral condition, to habitat having late-successional characteristics as released trees respond by increasing size and structural diversity, and as additional levels of larger down wood continue to accumulate. The developmental effects in riparian habitat should be particularly beneficial to fisher.

Cumulative Effects

Beyond the direct and indirect effects addressed associated with proposed activities under either action alternative, there are no Federal activities that are reasonably certain to occur within the planning area that would result in cumulative effects to fisher from modification of habitat.

Fishers have a well-documented sensitivity to disturbance connected with human activity. Effects of past, present, and expected human use and management activities combine to influence the potential for fishers to occupy habitat in or near the project area. Recreational activities associated with roads, trails, and campsites; along with habitat management associated with extensive timber harvest activity can be considered to have contributed to the potential extirpation of fishers from this area or to be compromising the ability of this species to thrive in formerly occupied habitat. The increasing trend in recreational use throughout this area may negatively influence occupancy of otherwise suitable habitat for the fisher.

Determination

It is recognized that because of the history of human use and management activities, the likelihood that habitat associated with this project area is currently occupied by fishers is low. There is no known threat to any local fisher population from activities proposed under the Traverse Creek Thin Project. This project does not propose any activity that should modify or otherwise disturb potential fisher denning or resting habitat. Considering the spatial and temporal extent of proposed activities across the planning area, the wide-ranging nature of daily movements associated with fisher foraging and/or dispersal behavior, along with the low likelihood of occurrence, this project should not result in disturbance to the species.

Neither the no action alternative nor the action alternatives propose disturbance activities within a management area established for a known nest site, or propose activities that would otherwise affect the integrity of potential nesting habitat; therefore, there will be **no impact (NI)** to Pacific fisher or their habitat.

Pacific Fringe-tailed Bat (*Myotis thysanodes vespertinus*)

Existing Condition

This bat is considered a riparian associate species that has been associated with mixed-conifer forests having relatively dry moisture regimes in the Coast Range and southern Cascade Range of Oregon (NatureServe 2008, O'Neil et al. 2001). Foraging behavior specific to this species is poorly documented, however they have been described as aerial foragers and hovering gleaners (O'Neil et al. 2001). Structures associated with live trees or snags have since been recognized as the primary roost structures for this species when it occurs in/near forested habitat and features associated with caves, mines, bridges or buildings may serve as primary roost structures in non-forested habitat (Hayes 2003).

Formal bat surveys within the planning area have not been conducted. There are no caves, mines, or abandoned wooden bridges and buildings that would serve as suitable hibernacula nor are there known roost sites associated with other structures within 250 feet that would be affected by proposed activities. Despite an overall lack of survey data, its presence has been documented on the Middle Fork Ranger District (Verts and Carraway 1998) including within the Fall Creek Watershed. The potential exists that at least single individuals may utilize available forage and roost habitat throughout the summer and early fall in or adjacent to areas where activities associated with proposed thinning would occur. For this evaluation, effects to this species from proposed activities are considered limited to within the project planning area.

When comparing use between non-riparian forested sites and open habitat (including harvested areas and meadows) bats often utilize open habitat more intensively (Hayes 2003). This may be in preference to areas with less clutter where foraging success on available prey would be higher. An anticipated short and long-term result of this project would be a post thinning habitat offering greater amount of edge habitat, overall reduced clutter yet with greater complexity in open habitat, and with abundant roost sites in both living and dead trees that would be expected to provide better overall foraging opportunities for most bat species including *Myotis thysanodes*.

The current composition of habitat throughout the planning area consisting of a mixture of forested and open habitat in both upland and riparian settings creates a moderate amount of edge habitat further increasing the potential that individuals may use the area for foraging and either day or night roosting. Bats are known to use edge habitat more frequently than forest or open habitat, which is likely a function of avoiding dense clutter associated with forest habitat and

areas where prey abundance may be reduced in open habitat (Hayes 2003). Myotis species are reported to use unharvested riparian habitat at rates between four and eight times greater compared to harvested riparian habitat that is associated with foraging adjacent to open water (Hayes 2003). A no-harvest buffer in riparian habitat averaging 15m on either side of all streams, seeps, and springs is included in the silvicultural prescription applied to either action alternative.

Environmental Consequences

Direct and Indirect Effects

No Action - Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to Pacific fringe-tailed bat or their habitat.

Action Alternatives - The consideration of direct effects to *Myotis thysanodes* from implementing the silvicultural prescription under either action alternative is directed to habitat disturbance associated with activities such as falling and yarding, and the subsequent potential disturbance resulting in loss or displacement of individuals that may be occupying affected habitat during these activities.

Direct effects to this species are judged by the amount of habitat modified or disturbed against the amount of habitat available in the Traverse Creek Thin Project planning area. All natural stands, 75 percent of the planning area, and 64 percent of previously managed stands within the planning area would be unaffected by proposed thinning. Thinning activities are proposed in about 36 percent of the previously harvested stands and would affect about 25 percent of the planning area. A variable density component to the silvicultural prescription, measures to protect existing snags, along with a riparian no-harvest buffer and a variety of seasonal restrictions would apply to either action alternative. The anticipated scheduling of harvest activities over a period of about 2 to 7 years would further stagger modification or disturbance of habitat spatially and temporally across the planning area.

These measures would provide a level of spatial and seasonal refugia for individuals that may be exposed to direct effects from proposed activities. Nevertheless, this project would result in disturbance or modification of some habitat features known to be associated with use by *Myotis thysanodes*. Direct effects associated with thinning activities may therefore result in a short-term adverse effect to an undeterminable number of individuals. However, current science also suggests that thinning activity as proposed may also result in short-term beneficial effects to bats (including this species) by attracting bats to areas of improved foraging habitat.

Structural changes resulting from thinning may benefit bats by allowing more effective use of habitat (Humes et al. 1999). The variable density thinning prescription proposed under the action alternatives would promote this improvement. Plants such as chinquapin and oceanspray are known to support high numbers of caterpillars (Muir et al. 2002), would respond favorably to proposed thinning, and would contribute to improved foraging opportunities in and near areas treated.

Indirect effects associated with habitat modification activities are considered beneficial to *Myotis thysanodes* for the following reasons. Implementing the silvicultural prescription as proposed should result in accelerating the transition from managed stands in a structurally simplified mid-seral condition, to habitat having late-successional characteristics as released trees respond by increasing size and structural diversity, and understory vegetation growth is stimulated.

One anticipated long-term result of the Traverse Creek Thin Project under the action alternatives would be that post thinning habitat would offer a greater amount of edge habitat, an overall reduced clutter yet with greater complexity in open habitat, and with abundant roost sites in both living and dead trees that would be expected to provide better overall foraging opportunities for most bat species including *Myotis thysanodes*.

Cumulative Effects

Beyond the direct/indirect effects addressed associated with proposed activities under either action alternative, there are no Federal activities that are reasonably certain to occur within the planning area that would result in cumulative effects to *Myotis thysanodes* from modification or consequential disturbance of habitat.

Determination

There is no known threat to hibernacula or maternity roosts from activities proposed under the Traverse Creek Thin Project. Habitat in natural stands or open areas throughout the planning area associated with highest potential to be utilized by *Myotis thysanodes* would not be modified or disturbed by Traverse Creek Thin Project activities. However, the potential for activities to modify or disturb potential roosting or forage habitat, or disturb individuals that may be utilizing such habitat exists within the planning area. Therefore it is determined that activities as proposed under either action alternative could result in a situation that **may impact individuals or their habitat, but the action will not likely contribute to a trend towards Federal listing** or loss of viability to the population or species for *Myotis thysanodes*. This potential impact is considered the same across either action alternative.

Oregon Slender Salamander (*Batrachoseps wrightorum*)

Existing Condition

Specific details regarding habitat requirements and life-history accounts are not well documented for the Oregon slender salamander – a species endemic to the western slopes of the Oregon Cascades.

Suitable habitat for this species occurs throughout portions of the planning area, including areas proposed for thinning activities under either action alternative. Suitable habitat can briefly be described as forested areas, especially old-growth Douglas-fir and potentially younger stands if large down logs are abundant (Blaustein et al. 1995, Csuti et al. 1997, Gilbert and Allwine 1991, Nussbaum et al. 1983). Oregon slender salamanders are known to generally inhabit the interior of down logs (Rose et al. 2001). During the breeding period from April through June, and again during wet fall weather individuals have been located within large decaying stumps and logs, under bark and moss in Douglas-fir forests, and under rocks or logs of moist hardwood forests within coniferous forest landscapes (Corkran and Thoms 2006, Leonard et al. 1993, O'Neil et al. 2001). These salamanders then undergo periods of seasonal inactivity where they reside below ground during dry summer months and mid-winter (Corkran and Thoms 2006, O'Neil et al. 2001). Locations where this species has been documented range from near sea level to above 4,000 feet elevation (NatureServe 2008, O'Neil et al. 2001).

For this evaluation, effects to this species from proposed activities are considered limited within the project planning area. Oregon slender salamanders have been documented at sites across the Willamette National Forest including the Middle Fork Ranger District. Surveys were conducted in the spring of 2008 in the Winberry drainage among seven older forest stands and no salamanders were found (Willamette NF, unpublished data). Based on what is known about

habitat preferences for Oregon slender salamander the most likely locations within the planning area where this species may occur is in old-growth habitat along with previously harvested stands where higher concentrations of large down wood and stumps still exist – especially if composed of Douglas-fir. O'Neil et al. (2001) consider a general association between Oregon slender salamander and the WLCH habitat type descriptive of the Traverse Creek Thin Project area suggesting their occurrence in the area may be likely.

Environmental Consequences

Direct and Indirect Effects

No Action -Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to Oregon slender salamander or their habitat.

Action Alternatives - The consideration of direct effects to Oregon slender salamanders from implementing the silvicultural prescription under either action alternative is directed to habitat disturbance associated with activities such as falling and yarding, plus pile burning and the subsequent potential disturbance resulting in loss or displacement of individuals that may be occupying affected habitat during these activities.

Direct effects to this species are the amount of habitat modified or disturbed against that which is available throughout the Traverse Creek Thin Project planning area. All natural stands, 82 percent of the planning area would be unaffected by proposed thinning. Thinning activities would affect about 18 percent of the planning area. A variable density component to the silvicultural prescription, measures to protect existing large down logs, along with a riparian no-harvest buffer and a variety of seasonal restrictions would apply to either action alternative. The anticipated scheduling of harvest activities over a period of about 2 to 7 years would further stagger modification or disturbance of habitat spatially and temporally across the planning area.

These measures would provide a level of spatial and seasonal refugia for individuals that may be exposed to direct effects from proposed activities. Nevertheless, this project would result in unavoidable and incidental disturbance or modification of some habitat features known to be associated with use by Oregon slender salamander. Direct effects associated with thinning activities may therefore result in a short-term adverse effect to an undeterminable number of individuals. Protecting existing large down logs during all proposed activities, as stated in the silvicultural prescription would ensure any negative direct effect to this species is minimized.

Indirect effects associated with habitat modification activities are considered beneficial to Oregon slender salamanders for the following reasons. Implementing the silvicultural prescription as proposed should result in accelerating the transition from managed stands in a structurally simplified mid-seral condition, to habitat having late-successional characteristics as released trees respond by increasing size and structural diversity, understory vegetation growth is stimulated, and as additional levels of larger down wood continue to accumulate. Indirect effects are recognized as the same across both action alternatives.

Cumulative Effects

Beyond the direct/indirect effects addressed associated with proposed activities under either action alternative, there are no Federal activities that are reasonably certain to occur within the planning area that would result in cumulative effects to Oregon slender salamanders from modification or consequential disturbance of habitat.

Determination

There is no known threat to local populations of Oregon slender salamander from activities proposed under the Traverse Creek Thin Project. Certain activities associated with this project such as falling, yarding, and fuels treatment have the potential to modify or disturb potential breeding, cover, or forage habitat, or disturb individuals that may be utilizing such habitat. These activities would affect less than 18 percent of the planning area where suitable habitat for this species is patchily distributed. Although the risk is considered short-term and the likelihood of occurrence may be low, it is determined that activities as proposed under either action alternative could result in a situation that **may impact individuals or their habitat, but the action will not likely contribute to a trend towards Federal listing** or loss of viability to the population or species for Oregon slender salamander. This potential impact is considered the same across both action alternatives.

Cascade Torrent Salamander (*Rhyacotriton cascadae*)

Existing Condition

Torrent salamanders are specialized for life in cold water associated with springs, seeps, headwater streams, and waterfall splash zones (Corkran and Thoms 2006, Csuti et al. 1997) in microclimatic and microhabitat conditions that generally exist only in older forests (NatureServe 2008). *R. cascadae* is dependant on this type of aquatic environment for all aspects of its life history. The species opportunistically feeds on aquatic and semi-aquatic invertebrates, and is seldom located more than one meter from water.

R. cascadae can reach high densities in appropriate habitat (Leonard et al. 1993) which may help to explain why a surprising number of individuals were documented at sites during habitat surveys conducted between August 1995 and August 1997 on the Middle Fork Ranger District. During that timeframe at least 66 individuals were documented at 13 locations, with three locations being in the Winberry Creek watershed. No formal surveys for Cascade torrent salamanders have been conducted within the Traverse Creek Thin Project area.

Potential effects to habitat for *R. cascadae* from activities proposed under either action alternative are considered limited to habitat within the planning area boundary. Suitable habitat for this species exists within limited stretches of aquatic and immediately adjacent moist forested habitat within riparian reserves throughout this area. These limited areas are expected to provide nesting, cover, foraging, and possibly very limited dispersal opportunities for these aquatic salamanders.

Because of riparian reserve buffers, areas associated with commercial thinning activities proposed under both action alternatives do not contain suitable habitat for Cascade torrent salamanders and are considered beyond a distance that would create the potential for disturbance of the species should it occur in suitable habitat.

Environmental Consequences

Direct and Indirect Effects

No Action - Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to Cascade torrent salamander or their habitat.

Action Alternatives - The Traverse Creek Thin Project as proposed would not modify or otherwise disturb suitable habitat, or cause any level of negative effects that would influence the

potential for persistence of the Cascade torrent salamander in the limited amount of suitable habitat occurring in portions of the project area.

Due to protection measures listed in the silvicultural prescription that apply to riparian habitat associated with any thinning activity, no management activities are proposed that would affect suitable habitat allied with some sections of streams in the planning area. No direct effects to Cascade torrent salamanders are anticipated as a result of activities proposed under either action alternative associated with the Traverse Creek Thin Project.

Suitable habitat for Cascade torrent salamanders may likely improve as a result of this project's influence on riparian habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity. Indirect effects are considered the same across both action alternatives.

Cumulative Effects

Beyond the direct/indirect effects addressed associated with proposed activities under both action alternatives, there are no reasonably foreseeable Federal activities that would result in contributing to cumulative effects to habitat for Cascade torrent salamanders within the Traverse Creek Thin Project planning area.

Determination

Because suitable habitat for Cascade torrent salamanders exists in portions of the planning area and would not be modified by or result in any disturbance from activities associated with proposed thinning under either action alternative, it is determined this project should have **no impact** on Cascade torrent salamanders or their habitat.

Crater Lake Tightcoil (*Pristiloma arcticum crateris*)

Existing Condition

The species is endemic to Oregon, and known to occur above 2,000 feet elevation throughout the Oregon Cascades from the Mt. Hood National Forest south to the Winema National Forest. As of August 2005, specimens had been confirmed at approximately 160 sites from very limited locations across this range (Duncan 2004, NatureServe 2008).

Habitat and Ecology

Pristiloma arcticum crateris “may be found in perennially moist situations in mature conifer forests and meadows among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 m. of open water in wetlands, springs, seeps and streams, generally in areas which remain under snow for long periods in the winter. Essential habitat components include uncompacted soil, litter, logs, and other woody debris in a perennially wet environment.”(Duncan 2004).

This species is among many organisms functioning as primary and secondary consumers that contribute to soil building and dissemination of spores and microbes. Having very limited dispersal capabilities on their own, they may be assisted in dispersal by other vectors capable of transporting mud that may contain eggs or adults across distances into suitable habitat (Duncan 2004). An example of such dispersal could be individuals in mud transported on the hoof of a deer or elk.

Loss or degradation of suitable wetland habitat has been identified as the major threat to this species.

Effects to this species from proposed activities are considered limited to within the Traverse Creek Thin project planning area. Prior to 2005, the presence of the Crater Lake Tightcoil had not been documented on the Willamette National Forest. However, in May 2005 a confirmed specimen was collected in the Middle Fork Range District from a site within the Niner Project area, approximately 8 miles to the southeast of the project area.

Suitable habitat for this species exists in numerous locations throughout the planning area and is associated with perennially wet areas within riparian reserves. Locations where culvert replacement is identified are associated with areas where streamflow is either intermittent or flowing within a well-defined channel. These locations are therefore not considered suitable habitat.

Based on the three evaluation criteria to determine the need to conduct a survey, surveys for Crater Lake Tightcoil are not considered required for this project. This determination is made because each of the three criteria necessary to trigger a survey would not be met for the following reasons:

- A minimum 50-foot (15 meter) buffer adjacent to each side of all Class I – III streams, plus any seep, spring, or wetland would be applied in riparian habitat under the silvicultural prescription for either action alternative.
- Riparian habitat associated with class IV streams is not considered suitable habitat for this species but would also be protected from disturbance by a 50-foot (15 meter) buffer adjacent to each side of the stream channel.
- Locations where culvert replacement associated with road maintenance is proposed are not considered suitable habitat.
- No activities are proposed that would disturb or modify suitable habitat within the prescribed riparian buffer.
- Implementing the silvicultural prescription as proposed will ensure maintenance of ambient environmental conditions within the primary and secondary shade zones associated with aquatic habitat, and thereby maintain microclimate conditions in habitat for this species.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

No Action - Under the no action alternative, there will be no new management activities; therefore, there would be no direct, indirect or cumulative effects to Crater Lake tightcoil or their habitat.

Action Alternatives - Management considerations for this species' habitat (Duncan 2004) are reflected in the project's silvicultural prescription. Mitigation measures that protect habitat for this species are incorporated into the silvicultural prescription for both action alternatives. Among the specific measures developed are some that address soil, water, and riparian habitat conditions that should ensure suitable habitat for Crater Lake Tightcoil is protected from undesirable impacts. Such measures include: no harvest riparian buffers, directional falling away from streams, no yarding across streams, partial or full suspension yarding for areas not helicopter yarded.

Due to protection measures listed in the silvicultural prescription that apply to riparian habitat associated with any thinning activity, and no management activities are proposed that would affect a known site. No direct effects to Crater Lake tightcoil are anticipated as a result of activities proposed under either action alternative associated with the Traverse Creek Thin Project.

Suitable habitat for Crater Lake tightcoil may likely improve as a result of this project's influence on riparian habitat responding to silvicultural objectives such as increasing growth, structure, and overall diversity. Indirect effects are considered the same across both action alternatives.

Cumulative Effects

Beyond the direct/indirect effects addressed associated with proposed activities under either action alternative, there are no reasonably foreseeable Federal activities that have not addressed habitat protection for this species or would result in cumulative effects to habitat for Crater Lake tightcoil within the Traverse Creek Thin Project planning area.

Determination

Because the Traverse Creek Thin Project does not propose activities that would modify or otherwise disturb suitable habitat for the species, it is determined this project should have **no impact** on Crater Lake tightcoil.

Management Indicator Species

The Willamette LRMP has identified a number of terrestrial wildlife species with habitat needs that are representative of other wildlife species with similar habitat requirements for survival and reproduction. These management indicator species (MIS) include spotted owl, bald eagle, cavity excavators, pileated woodpecker, deer, elk, and marten. These species were selected because they have potential to occur in or near the project area. Spotted owls are addressed in the Threatened Species section; bald eagles are addressed in the Sensitive Species section. Standards and guidelines are met under all action alternatives.

Table 18. Management indicator species, represented habitat, and presence of habitat within the Traverse Creek project area

Species	Represented habitat	Habitat present within the project area
Northern spotted owl	Old growth	Yes
Bald eagle	Threatened and Endangered species	Nearby, use area for foraging
Cavity excavators	Dead and decaying	Yes
Pileated woodpecker	Old growth	Yes
Deer	Winter range, Big game emphasis areas	Yes
Elk	Winter range, Big game emphasis areas	Yes
Marten	Old growth	Yes

Marten (*Martes americana*)

Existing Condition

Marten occupy a narrow range of habitat types found in or near coniferous forests. More specifically, they associate closely with late-successional stands of mesic conifers – especially those with complex physical structures near the ground such as large low snags and down wood (NatureServe 2008, Ruggiero et al. 1994, Verts and Carraway 1998). Current habitat in portions of the planning area can be described as having such characteristics, and may support use by this species. Prior to initial harvest activity, habitat throughout most of the planning area would have provided the canopy cover and ground level structural complexity favored by this species for selection as optimum breeding/denning habitat. Despite lack of documented presence in the immediate vicinity, it is assumed that marten are likely a member of the local faunal community.

As described earlier in this report, snag and down wood habitat throughout the project area are considered abundant relative to natural conditions for the habitat type and structural condition. These habitat components are important in influencing the presence of this MIS in the project area. Approximately 200 acres of remnant forest located in the southeast area of the planning area has been designated as a marten habitat area (Management Area 9c) under the Willamette LRMP (1990).

Benette and Samson (1984) found marten population size and condition, and dispersal rates are correlated to small mammal populations. Coarse woody debris is an important habitat component for marten. The accumulation of coarse woody debris provides subnivian access in winter to hunt for voles, mice, and pika and it provides secure resting sites (Buskirk 2002). In addition to the downed wood effects, thinning should also have a beneficial effect on marten habitat. An increase in key food sources such as a greater berry production and a population increase in mice, voles, and other small mammals in the thinned areas is expected.

Habitat associated with proposed harvest units is recovering from seral simplification as a result of previous intensive harvest activity. Commercial thinning these stands under the silvicultural prescription applied to either action alternative would encourage development of structural diversity throughout, and adjacent to areas treated. The variable density thinning proposed by this project is believed to influence accelerated development of many aspects of biodiversity where it is lacking as a result of previous management (Franklin et al. 1997, DeBell et al. 1997).

Management activities proposed under either action alternative do involve modification or disturbance of suitable habitat for this species however. Commercial thinning activities would occur within stands that are well distributed across the planning area. Removal of standing green trees, loss of snags that pose a risk to worker safety, and disturbance of some large down wood from effects of harvest activities would occur in these stands. The snags and down wood section of this report provides a thorough discussion of how dead wood habitat important to this species may be affected by proposed commercial thinning.

Currently the ONHP, TNC, and the ODFW show the status of this species to be secure or not immediately imperiled, which suggests species viability may be assured as long as adequate protection measures such as standards and guidelines governing activities proposed by this type of project continue to be implemented. The changing trend in timber management that has occurred within the past decade, and projected for the future, may positively influence occupancy of suitable habitat for marten as previously harvested stands redevelop, and more emphasis is placed on recruitment of key structural components missing from harvested stands and retention of key structural components present in unharvested stands.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Project effects (direct and indirect) to this species are considered relative to the large home range size and the amount of habitat modified or disturbed against the amount available throughout the area. Any negative effects associated with activities are considered short term, and suitable foraging along with some denning habitat would continue to be provided throughout the project area both during and after commercial thinning is completed. Approximately 82 percent of the planning area would not be affected by proposed activities. Any modification or disturbance of habitat for this species would be limited to approximately 18 percent of the planning area under either action alternative, and would largely be limited to disturbance of foraging habitat. Commercial thinning as proposed by this project should have little to no effect on this species or its ability to persist within the project area.

Long-term (more than 10 years) effects of the Traverse Creek Thin Project should be positive on marten as habitat throughout the project area develops into condition favoring the welfare of this species. Marten should benefit from an increase in key food sources from greater berry production and higher mice, vole, and other small mammal populations resulting from forest thinning. Effects would result in a negligible positive contribution to cumulative effects that have already occurred from past management actions throughout the project area. There are no foreseeable actions that should affect habitat for this species in the planning area.

Deer and Elk (Big Game)

Existing Condition

The Willamette LRMP (1990) selected deer and elk as MIS because of their economic and aesthetic value to local communities, hunters, and recreationists. The desired future condition for big game habitat is stated as follows: Elk habitat will be improved or maintained in areas managed for a high emphasis objective for big game. Forage enhancement projects, well distributed mature conifer stands for optimal cover, and controlled road access in the winter ranges will be evident in the high emphasis areas. The basic habitat components of forage and cover will be provided in areas with moderate or low emphasis objectives also, but in lesser quantity, distribution and quality (LRMP, p. IV-7).

The Traverse Creek Thin Project planning area encompasses three Big Game Emphasis Areas (BGEA): Brush Creek, North Fork Winberry and Lower South Fork Winberry/Monterica. Brush Creek is designated as a moderate level, winter range use emphasis area, 100 percent of which is located within the northern half of the planning area. North Fork Winberry is designated as a moderate level, winter and summer use emphasis area, 100 percent of which is located within the middle of the planning area and Lower South Fork Winberry/Monterica is designated as a low level, winter range use emphasis area, 100 percent of which is located within the southern half of the planning area.

Table 19 displays HEI conditions over the past twelve years, and reveals the downward trend in forage habitat and subsequent decline in overall big game habitat quality in these areas. This trend has been validated elsewhere in the Middle Fork Ranger District during other recent project planning, and across the Willamette National Forest.

Habitat Effectiveness Index (HEI) analysis (Wisdom et al. 1986) for Brush Creek and North Fork Winberry BGEA indicates that current individual values for forage quality (HEf) are below LRMP standards and guidelines. Because of the low HEf values, the overall HEI value also falls

below current standards and guidelines for a moderate level BGEA. Individual effectiveness values for habitat patch size and spacing (HEs) and cover quality (HEc) are currently above LRMP standards and guidelines for all three BGEAs. Recent analysis for Lower South Fork Winberry/Monterica BGEA shows that current habitat quality for all individual indices, and overall HEI, exceeds Standards and guidelines for a low level BGEA.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Direct and indirect effects from proposed activities are considered in the context of disturbance and habitat modification. Individuals that are within close proximity to proposed activities are likely to leave the area while the disturbance is underway. Disturbance may include falling, yarding, hauling, fuels treatment, and other prescribed activities. However, those activities are expected to occur at a spatial and temporal extent such that they should not result in negative direct or indirect effects to individuals or the local population.

Table 19. HEI comparison of 12 year change and Traverse Creek Thin Project (TC) alternative effects on big game habitat in Brush Creek, Lower South Fork Winberry/Monterica and North Fork Winberry BGEAs

HEI Modeling Output	Brush Creek: Moderate Emphasis Level BGEA				
	Individual Indices				Overall Index
	HEs	HEr	HEc	HEf	HEI
Winberry/Lower Fall Creek WA 1996	0.64	0.39	0.58	0.42	0.50
Current (2008)	0.68	0.33	0.58	0.13	0.36
TC Alternative 2	0.83	0.33	0.62	0.10	0.36
TC Alternative 3	0.83	0.33	0.62	0.10	0.36
HEI Modeling Output	**Lower S.F. Winberry/Monterica: Low Emphasis Level BGEA**				
	Individual Indices				Overall Index
	HEs	HEr	HEc	HEf	HEI
Winberry/Lower Fall Creek WA 1996	0.88	0.52	0.52	0.35	0.54
Current (2008)	0.76	0.62	0.51	0.25	0.50
TC Alternative 2	0.23	0.62	0.46	0.10	0.29
TC Alternative 3	0.23	0.62	0.46	0.10	0.29
HEI Modeling Output	**North Fork Winberry: Moderate Emphasis Level BGEA**				
	Individual Indices				Overall Index
	HEs	HEr	HEc	HEf	HEI
Winberry/Lower Fall Creek WA 1996	0.81	0.39	0.61	0.47	0.55
Current (2008)	0.77	0.40	0.59	0.19	0.43
TC Alternative 2	0.91	0.43	0.63	0.10	0.40
TC Alternative 3	0.91	0.40	0.63	0.10	0.39

Willamette NF Land Management Plan standard and guideline target level:
Moderate Level BGEA Individual Index: >0.4 Overall Index: >0.5
Low Level BGEA Individual Index: >0.2 Overall Index: increase if any variable < 0.2
Index Definitions: HEs = size and spacing HEr = open road density HEc = cover quality
HEf = forage quality HEI = overall habitat quality

Table 19 displays projected effects of either action alternative against the current habitat effectiveness baseline (no action alternative) resulting from model output (Wisdom et al. 1986) for each affected BGEA. The effect of commercial thinning and associated activity proposed by Traverse Creek Thin Project in approximately 24 percent of Brush Creek BGEA, 1 percent of Lower South Fork Winberry/Monterica BGEA and 28 percent North Fork Winberry BGEA results in changes to habitat effectiveness values. However, current modeling methods may not be sensitive enough to accurately reflect changes to big game habitat in the area resulting from proposed activities. For example, forage values are expected to increase from proposed patch cuts; however, forage quality (HEf) decreases according to the model. It is understood that the model cannot account for the forage value of gaps because they are just one part of the harvest prescription.

Habitat modification associated with the Traverse Creek Thin Project as described previously can be summarized as having the following direct and indirect effects on deer/elk:

- Commercial thinning and related activities would occur in approximately 24 percent of Brush Creek BGEA.
- Commercial thinning and related activities would occur in approximately 28 percent of North Fork Winberry BGEA.
- Commercial thinning and related activities would occur in approximately 1 percent of Lower South Fork Winberry/Monterica BGEA.
- Approximately 2 miles of currently open roads would be closed throughout the planning area under Alternative 2. No additional roads would be closed under Alternative 3.
- Approximately 4.5 miles of temporary road construction would occur under both Alternatives.
- Proposed activities would elevate all aspects of habitat quality for deer/elk in all three BGEAs.
- Create small opening promoting short-term forage increase.

Under the proposed action, small openings (1 acre or less) would be created on up to 385 acres, while Alternative 3 would have small gaps (1 acre or less) on up to 410 acres and gaps up to 3 acres on up to 103 acres. A comprehensive review of literature by Lyon and Christensen (2002) reported increases in understory forage production after thinning of forest stands. After treatment, these areas would be seeded with an approved forage mix. Any increase in the amount and extent of forage habitat would benefit deer and elk within any of the BGEAs affected by proposed thinning. High-quality forage habitat would exist in these areas until seedlings grew to outcompete other forage vegetation.

As evidenced by the positive-growth response of native forage species to reduction in forest overstory cover associated with previous commercial thinning activity in portions of the project area, an increase in forage quantity is assured to occur in areas associated with thinning proposed by Traverse Creek Thin Project. Declines in forage quality (digestibility) are known to occur in conjunction with increases in forage quantity responding to growth stimulated by overstory removal (Cook 2002). However, this relation appears to be variable between study sites and across regions. Dynamic shade patterns resulting from buffered riparian reserves and variable density thinning should mitigate potential negative responses discussed by Cook (2002) in forage quality against positive responses in forage quantity. Evidence suggests the diversity of tree, shrub, grass, and forb species throughout the project area will respond favorably to restoration activities thereby adding to overall quality of habitat for big game.

The effectiveness of increasing big game forage habitat under either action alternative would be further enhanced by implementing proposed road closures. Open road density would be reduced under any action alternative by implementing the road closures recommended in the transportation report. Approximately 4.5 miles of temporary road is proposed under Alternatives 2 and 3. Approximately 3.96 miles of additional road closures of existing roads are proposed under Alternative 2 bringing the road closure total for this alternative to 8.46 miles. No additional road closures would occur under Alternative 3.

In a general context, cumulative effects of the Traverse Creek Thin Project on deer/elk would be positive in the short-term (less than 10 years) yet inconsequential in the long term and relative to cumulative effects from past actions that have created the current habitat condition throughout the three BGEAs. There are no foreseeable actions that would modify habitat in these BGEAs.

Given what is currently known about local deer and elk populations, the future viability of these species in this area should be assured as long as habitat management opportunities continue to be implemented, and adequate protection measures such as standards and guidelines governing activities proposed by the Traverse Creek Thin Project continue to be implemented.

Primary Cavity Excavator Species

Pileated Woodpecker (*Dryocopus pileatus)*

Existing Condition

Because of home range size or dispersal capabilities for this species and the spatial extent of areas proposed for commercial thinning activity, effects from proposed activities are considered in relation to the Traverse Creek Thin Project planning area in general.

As described earlier, snag and down wood habitat throughout the project area are considered abundant relative to natural conditions for the habitat type and structural condition. These habitat components are important in influencing the presence of this MIS in the project area. Current, as well as historic composition and structure associated with the habitat type and plant associations for this area favor nesting and foraging use by pileated woodpeckers (Csuti et al. 1997, Marshall et al. 2003, NatureServe 2008, O'Neil et al. 2001). Approximately 350 acres of remnant forest located in the northwest area of the planning area has been designated as a pileated woodpecker habitat area (Management Area 9b) under the Willamette LRMP (1990). This species has been detected on numerous occasions during field visits throughout the planning process. Typical foraging sign can be commonly found on trees and logs throughout the planning area. Favored tree species appear to be western redcedar, Douglas-fir, and grand fir. There are no known nest trees within any proposed harvest unit or elsewhere throughout the planning area.

The Traverse Creek Thin Project proposes commercial thinning more in the context of promoting general diversity rather than focusing on the habitat requirements of any specific individual or group of species. Nevertheless a comparison of current dead wood habitat within the planning area against data from DecAID (Mellen et al. 2006) pertaining to pileated woodpecker habitat use reveals the following relative to size and distribution for both snags and down wood:

- Abundant foraging habitat within the 50 percent tolerance interval exists throughout the planning area, and will remain after thinning

- Nesting and roosting habitat currently falls within the 30 percent tolerance interval throughout the planning area, and should experience an accelerated gradual increase after thinning.

Management activities proposed under either action alternative do involve modification or disturbance of suitable habitat for this species however. Removal of standing green trees, loss of snags that pose a risk to worker safety, and disturbance of some large down wood from effects of harvest activities would occur. The snags and down wood section of this report provides a thorough discussion of how dead wood habitat important to this species may be affected by proposed commercial thinning.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Project effects (direct and indirect) to this species are considered relative to the large home range size (greater than 1,000 acres) and the amount of habitat modified or disturbed against the amount available throughout the area. Any negative effects associated with activities are considered short term, and suitable foraging and nesting habitat would continue to be provided throughout the project area both during and after commercial thinning is completed. Approximately 82 percent of the planning area would not be affected by proposed activities. Any modification or disturbance of habitat for this species would be limited to approximately 18 percent of the planning area under either action alternative, and would largely be limited to disturbance of foraging habitat. Commercial thinning as proposed by this project should have little to no effect on this species or its ability to persist within the project area.

Project effects would result in a negligible contribution to cumulative effects that have already occurred from past management actions within the project area.

The pileated woodpecker was formerly listed by the Oregon Natural Heritage Information Center (ORNHIC) among rare, threatened, and endangered species of Oregon. The species was dropped from the list in 2004 because it was found to be too common (ORNHIC 2004). Currently NatureServe (2008) and the Oregon Department of Fish and Wildlife (ODFW) show the status of the pileated woodpecker to be secure, which suggests the changing trend in timber management that has occurred within the past decade, and projected for the future, may positively influence occupancy of suitable habitat by this species as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in unharvested stands. Effects of the Traverse Creek Thin Project should be positive on pileated woodpeckers as habitat throughout the project area develops into condition favoring the welfare of this species along with a diverse assemblage of others.

Other Cavity Excavators

Existing Condition

The significance of snags as one component characterizing both old-growth and younger timber stands, and the dependence of primary cavity excavators on this component as MIS that provide nesting and denning habitat for numerous additional species of birds and mammals (secondary cavity nesters) is thoroughly addressed in the Willamette LRMP (1990). A complete list and discussion of these species can be found on page 74 in Chapter III of the LRMP FEIS. The significance of this relationship is further emphasized by management standards and guidelines under the Northwest Forest Plan ROD (USDA Forest Service and USDI Bureau of Land Management 1994b,) and elsewhere throughout published literature (Hagar et al. 1996, Hallett et

al. 2001, Lewis 1998, Muir et al. 2002, Olson et al. 2001, Rose et al. 2001). Five out of eight species of primary cavity excavators used as ecological indicators in the Willamette LRMP are known to occur within the Traverse Creek Thin Project planning area. Visual or audible detection plus visual indicators of presence (use sign) have confirmed the presence of the following five primary cavity excavator MIS: red-breasted nuthatch, northern flicker, hairy woodpecker, downy woodpecker, red-breasted sapsucker. The remaining three species (Lewis' woodpecker, black-backed woodpecker, and three-toed woodpecker) are generally not associated with Westside lowlands conifer-hardwood forest habitat that defines stands throughout the planning area (Marshall et al. 2003, O'Neil et al. 2001, NatureServe 2008).

The young stand study grouped cavity-nesters that included these species when considering post treatment effects of commercial thinning on this group of birds (Hagar et al. 2004). Data analysis revealed the following for cavity nesters:

- Bird species richness (number of species/stand) was positively affected by thinning, and increased to the greatest extent in stands that were heavily thinned.
- No species regularly detected prior to thinning were absent during post-treatment surveys regardless of thinning intensity.
- Thinning prescription had no influence on bird density (number of individuals/acre) for this group.

Another study investigating wildlife response to effects of thinning in similar habitat has shown that red breasted nuthatch and hairy woodpecker populations increased after thinning despite overall lower snag densities (Hayes et al. 1997).

Environmental Consequences

Direct and Indirect Effects

Project effects (direct and indirect) to this group of species are considered relative to the amount of habitat modified or disturbed against the amount available throughout the Traverse Creek Thin Project planning area. Any negative effects associated with activities are considered short term, and suitable foraging and nesting habitat would continue to be provided throughout the project area both during and after commercial thinning is completed. Approximately 75 percent of the planning area would not be affected by proposed activities. Any modification or disturbance of habitat for these species would be limited to approximately 18 percent of the planning area under either action alternative, and would largely be limited to disturbance of foraging habitat. Because of a variety of spatial and temporal operating restrictions that would apply to harvest activities, disturbance to individuals that may be in close proximity to activities would generally be limited to outside the breeding season (Marshall et al. 2003). Research results suggest commercial thinning as proposed by this project should have a positive indirect effect on this group of MIS, and little to no negative direct effect on these species or their ability to persist within the project area.

Implementing the silvicultural prescription associated with either of this project's action alternatives would result in maintaining a partial no-harvest buffer in all riparian reserves, plus protection and retention of habitat features such as snags, hardwoods and any remnant conifers (many of which possess decadent features making them suitable for use by cavity excavators). One anticipated result of this project would be a post-treatment habitat offering greater amount of edge habitat, with greater complexity in more open habitat, and with abundant forage and nesting opportunities in both living defective and dead trees that can be considered to provide better

overall habitat for a greater diversity of cavity excavator species (Hagar et al. 2004, O'Neil et al. 2001, Marshall et al. 2003, NatureServe 2008).

Management activities proposed under either action alternative do involve modification or disturbance of suitable habitat for these species however. Removal of standing green trees, loss of snags that pose a risk to worker safety, and disturbance of some large down wood from effects of harvest activities would occur. The snags and down wood section of this report provides a through discussion of how dead wood habitat, important to these species, may be affected by proposed commercial thinning.

Cumulative Effects

Past management actions related to timber harvest activity are generally responsible for the defining the current condition of habitat throughout the planning area relative to suitability for primary cavity excavators. These actions have affected the overall amount and seral stage distribution of forested habitat largely by reducing the amount of old-growth habitat and increasing the amount of mid-late seral habitat. There are no foreseeable actions that would affect seral stage habitat in this area and influence future suitability for primary cavity excavator.

The contribution of effects from this project on seral stage habitat that influences suitability for primary cavity excavator MIS would be beneficial relative to cumulative effects from past actions. Current science and the changing trend in timber management that has occurred within the past decade, and projected for the future, should positively influence management of habitat for this group of species towards a historic condition as previously harvested stands and riparian reserves redevelop, and more emphasis is placed on retention of key structural components in unharvested stands.

Landbirds Including Neotropical Migratory Birds

Existing Condition

Land bird species exhibit a dramatic response to the height, seral stage, canopy structure, and spatial distribution associated with forest habitat where greater numbers of birds are associated with more complex heterogeneous forested landscapes (Altman 1999). The current amount of forested and open ecotone habitat throughout the project area should be attractive for use by a variety of avian species (Gilbert and Allwine 1991). However effects of past management practices (extensive timber harvest) have resulted in a general simplification of habitat throughout much of this area as a uniform canopy dominated by Douglas-fir closes in. In the small portion of the planning area where they still exist in previously harvested stands, many remnant overstory trees dominated by Douglas-fir are experiencing mortality associated with competition from the developing understory.

The importance of habitat associated with hardwood trees and shrubs has been widely documented in published literature as one of the leading factors influencing bird community composition in conifer-dominated landscapes that typify the Traverse Creek Thin Project planning area (Csuti et al. 1997, O'Neil et al. 2001, Marshall et al. 2003). Such habitat in this planning area is generally located in riparian reserves, but is scattered across upland settings also. A direct positive correlation has been shown to exist between abundance and distribution of hardwoods, and abundance and diversity of birds.

Management actions such as those proposed under either of this project's action alternatives are recognized as a key component of a conservation strategy for land birds in coniferous forests of

western Oregon (Altman 1999) that have been described by Rich et al. (2004) as the flagship habitat of the Pacific Biome. These actions can be considered particularly important when they involve restoration of diversity in habitat such as that associated with the Traverse Creek Thin Project planning area. Heavier thinning such as proposed under either Alternative 2 or 3 favors greater establishment and growth of hardwoods, shrubs, and conifer seedlings (Hayes et al. 1997). Proposed thinning also involves a variable density component to the silvicultural prescription that can be expected to further enable structural enrichment in treated stands while providing small-scale refugia for all elements of biodiversity (Franklin et al. 1997) including land birds/neotropical migrants.

The YSS grouped neotropical migrants that included 15 species from the local community when considering post treatment effects of commercial thinning on this group of birds (Hagar et al. 2004). Data analysis (YSS) revealed the following for neotropical migrants:

- Bird species richness (number of species/stand) was positively affected by thinning, and increased to the greatest extent in stands that were heavily thinned.
- No species regularly detected prior to thinning were absent during post-treatment surveys regardless of thinning intensity.
- A heavy thinning prescription had a positive influence on bird density (number of individuals/acre) for the neotropical migrant group.

Implementing the silvicultural prescription associated with either of this project's action alternatives would result in maintaining a partial no-harvest buffer in all riparian reserves, plus protection and retention of habitat features such as snags, hardwoods and any remnant conifers. One anticipated result of this project would be a post-treatment habitat offering greater amount of edge habitat, with greater complexity in more open habitat, and with abundant forage and nesting opportunities in both living and dead trees that can be considered to provide better overall habitat for a greater diversity of bird species (Hagar et al. 2004, O'Neil et al. 2001, Marshall et al. 2003, NatureServe 2008).

Habitat associated with approximately 82 percent of the planning area would not be subject to modification or disturbance from proposed thinning activities. Activities associated with approximately 18 percent of the acreage proposed for thinning would be subject to a variety of seasonal restrictions extending from March through mid-July. Restricting activities during this timeframe would avoid disturbance to the native bird community throughout most or all of the nesting season for these species (Marshall et al. 2003, NatureServe 2008). Disturbance in these areas would be spatially distributed across the planning area, and temporally distributed throughout multiple breeding seasons further reducing the likelihood of disturbance to individuals.

Environmental Consequences

Direct and Indirect Effects

For this review, effects to this group of species from proposed activities are considered limited to within the project planning area. Consideration of project effects (direct and indirect) to native bird species from proposed activities is directed to the potential for habitat modification and disturbance to occur associated with thinning units, and how thinning may affect habitat use.

Loss or displacement could occur of unknown individuals that could be occupying habitat during implementation of proposed activities such as falling, yarding, and pile burning. The number of

individuals and/or species potentially affected by proposed activities is unknown and considered unquantifiable without reliable survey data. The spatial and temporal extent of proposed activities that could result in disturbance to nesting birds in a small portion of the planning area should mitigate the overall potential for disturbance and provide protection for nesting birds as intended under the Migratory Bird Treaty Act. Based on management proposed under either action alternative, risk to individuals that may be present and directly affected by project activities is considered equal for either action alternative.

Short and long-term suitability of habitat in and near proposed treatment areas should improve for the majority of bird species that are likely to forage and nest in this area – albeit on a small scale compared to the surrounding landscape. Current science suggests these indirect effects are generally considered neutral or beneficial for all affected species, and are equal under either action alternative.

Cumulative Effects

Past management actions related to timber harvest activity are generally responsible for the defining the current condition of habitat throughout the planning area relative to suitability for land birds/neotropical migrants. These actions have affected the overall amount and seral stage distribution of forested habitat largely by reducing the amount of old-growth habitat and increasing the amount of mid-late seral habitat. There are no foreseeable actions that would affect seral stage habitat in this area and influence future suitability for this group of species.

Current science applied to standards and guidelines governing management of this area provide direction that should ensure the long-term maintenance of amount and distribution of suitable habitat for native resident and migratory land bird species. Due to the location of treated and untreated areas within the planning area, cumulative effects from this proposed thinning project under either action alternative should result in a positive yet minor contribution to overall effects from past actions.

Rare and Uncommon Species

Existing Condition

Great Gray Owl (Strix nebulosa)

Habitat in the area is not considered suitable as defined in the current great gray owl survey protocol (Version 3.0 January 2004). Proposed thinning activities would not modify or disturb any habitat associated with sighting locations on private land. Suitable habitat does not exist elsewhere within the planning area, and this species will not be further addressed in this document.

Red Tree Vole (Arborimus longicaudus)

No surveys were needed because the thinnings were treating young stands that aren't considered suitable habitat. This species will not be further addressed in this document.

Soil, Hydrology and Fisheries

The Traverse Creek Thin Project is located in the Winberry Creek 6th-level (also known as HUC 6) watershed and is part of the Fall Creek 5th-level watershed (also known as HUC5), in the Middle Fork Willamette River subbasin. The Traverse Creek Thin Project planning area encompasses the Brush, North Winberry, Monterica, and Lower South Fork Creek subdrainages.

The direct and indirect effects analysis for hydrology will be for the 14,037 acres within the project area. The cumulative effects analysis area for hydrology is 31,419-acre the entire Winberry Creek 6th-level watershed (see Figure 7). The direct/indirect and cumulative effects area for soils focuses on the treatment unit area.

Soil Resources

Detrimental soil conditions are used by the Forest Service as a measure of the amount of current and cumulative soil effects after proposed activities. Detrimental soil conditions are related to long-term soil productivity and short-term soil losses (erosion). A complete explanation of detrimental soil condition is contained in Region-6 Supplement No. 2500.98-1 (USDA Forest Service 1998). Detrimental conditions are determined by a combination of: puddling, displacement, burned soil, and erosion.

Region 6 Supplemental No 2500.98 (USDA Forest Service 1998) requires the following:

1. Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system.)

2. In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the proposed activity following project implementation and restoration must not exceed 20 percent.

3. In areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

Compliance with these standards and all other applicable laws and regulations considered for soil management under this analysis are given in Appendix A.

Existing Condition

Geology in this watershed primarily consists of igneous extrusives such as tuffs, lapilli tuffs, tuffaceous sedimentary pyroclastics, and lava flows (USDA Forest Service and USDI Bureau of Land Management 1996). The basaltic lava flows are layered between and on top of the tuff layers in the project area. The tuff ash is fairly impervious. Overlying basalt is capable of a high degree of water storage, and provides water movement along fractures. When fast downward percolating water from the basalt hits the impervious tuff layer it spreads laterally and resurges as springs on slopes. This contact plane is the origin of high ridge and larger slumps that contribute to debris flows and channel scouring throughout the area. Very prominent topographic benches are associated with slump deposits below contact of basalt and tuff, which may be multiple sequences. Debris slides can be found along the steeper streams. Slides and slumps have occurred throughout the project area with a high concentration in the headwaters of Blanket Falls Creek and Brush Creek. Many of the debris slides and slumps are associated with unstable geology along tuff-basalt contact zones (Moser 2008). There is also a high clay content in many of the soils, which increases the susceptibility of the soil to compaction.

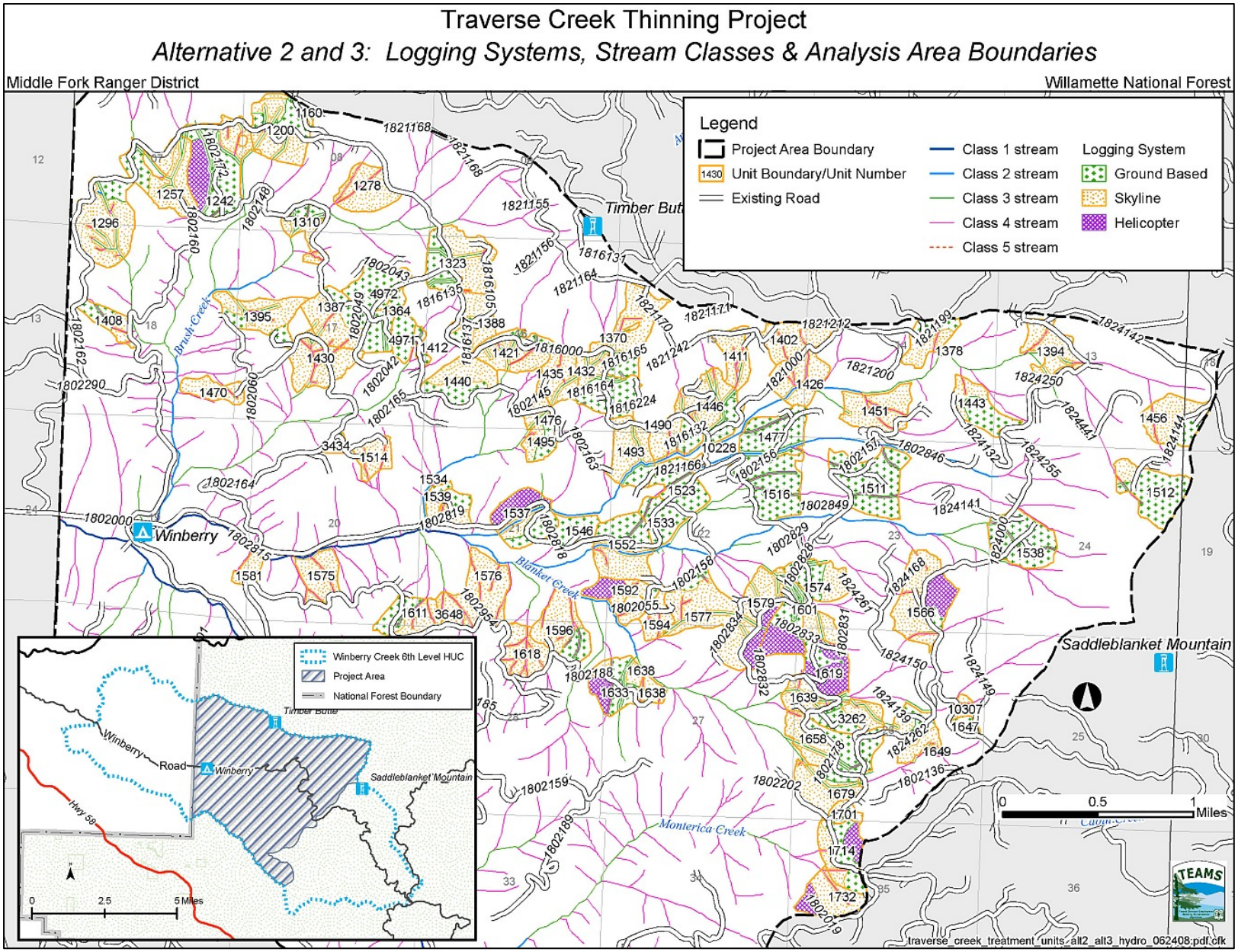

Figure 7. Map showing treatment units with logging systems and stream classes for the action alternatives

Some soils within the analysis area have high surface soil erosion potential and a high potential for land failures (mass wasting) which could be a source of sediments to streams. A way to quantify the soils with a high erosion potential and relate their location to the implementation of the project is to use the Willamette National Forest Soil Resource Inventory (SRI). The SRI was written in 1973 and the maps revised in 1990. The map revision has not been field verified but this tool provides a general soil description by category based on similar soil properties and expected behavioral response to management activities. For the sake of simplicity, the SRI has been divided into five categories (Table 20).

Table 20. SRI map units by soil category

Soil Category	Definition of SRI Soil Categories
Category 1	Nearly 100% clayey soils
Category 2	At least 50% clayey soils
Category 3	Nearly 100% steep ground and shallow soils
Category 4	At least 50% steep ground and shallow soils
Category 5	All others

Within the project area, 51 percent of the soils are in categories 3 and 4. These tend to be the soils most prone to slope failure. About 1.84 miles and 3.34 acres of temporary road are planned for SRI categories four and five. These categories have lower total clay content, a reduced surface erosion risk, but a higher risk of mass soil movements (landslides). Most of the ground-based operations (which have the potential to do the most damage) are proposed on the SRI category 1 soils. These soils are not as steep (greater than 40 percent) and are therefore less prone to mass soil movements. They can however be prone to compaction. Category 3 soils have less proposed harvest than the other four categories. These soils are the most prone to mass movements. Of the 80 proposed harvest units, 2 of them are currently over the 20 percent regional guideline threshold (see no action alternative, Table 21 below).

Table 21. Total number of units in each detrimental soil condition percentage category by alternative

Detrimental Soil Condition Percentages after Activities	0-9%	10-14%	15-19%	20%+
	Number of Units			
Alternative A (No Action)	51	25	2	2
Alternative B	1	16	38	25
Alternative C	1	16	38	25

Erosion potential occurs when bare ground with all organic matter is exposed as a result of management activity. The erosion potential is high for 24 percent of the project area (Table 22). Seventy-two percent of the project area soils have moderately to moderately severe erosion potential. The majority of high (severe, and severe to very severe) erosion potential soils are located on steep ground, which was either not proposed for harvest or treated with helicopter or skyline systems. High erosion potential soils proposed to be treated mechanically were visited in the field.

Table 22. Acres and percent of erosion hazard in the project area

Erosion Class	Acres	Percent
Slight	141	1
Slight-Moderate	352	3
Moderate	3,206	23
Moderate-Severe	6,894	49
Severe	2,733	20
Severe-Very Severe	601	4
Total	13,928*	

*Total is for soil acres only and does not include surface features like rock and water bodies.

Environmental Consequences

Direct and Indirect Effects

Alternative 1

No new detrimental soil impacts are expected under this alternative as no new timber harvest or road building would occur.

Alternatives 2 and 3

There is no difference in harvested acres, miles of temporary roads, or landings between Alternatives 2 and 3. The only difference is in the amount of and type of fuels treatment between these two alternatives, and the miles of roads to be closed at the conclusion of the project. The fuels treatments would not be mechanical treatments with the exception of a few roadside areas, which would not add to any of the estimates for detrimental soil condition. Therefore, the effects from both Alternatives 2 and 3 would be the same.

After consulting with the district hydrologist, David Murdough, and the project logging engineer, Rob Schantz, it was determined that the average skyline harvest unit results in 1.8 percent detrimental soil condition, helicopter harvest results in 1 percent detrimental soil condition, and ground based harvests result in an additional 10 percent detrimental soil condition (personal communication, 3/31 & 4/25/2008). It is not assumed that ground-based harvests only cause 10 percent of area to be in detrimental soil condition. The assumption is that there is likely to be over 15 percent of an area detrimentally impacted by ground-based harvests. However, much of this area is on pre-existing detrimental soil condition, and there is only an additional 10 percent added to the baseline amount. This does not include temporary roads and landings. It is assumed that an entire area of temporary road or landing is in detrimental soil condition. All temporary roads were assumed to have a 14-foot width and landings were assumed to be ¼ acre in size.

All proposed activities including landings, temporary roads, and skid trails would impact approximately 8.9 percent of the area across all units with detrimental soil conditions. This does not include the existing detrimental soil condition of 8.9 percent. The total detrimental soil condition after implementing the thinning would not necessarily be additive as some existing residual skid trails and landings would be utilized during thinning activities. For the purpose of this report, it is assumed there would be additive effects. This assumes a worst-case scenario. As stated above, it was noted in the field that a concentration of the detrimental soil condition in each unit was on the proposed temporary roads. This leads to the conclusion that many of the cumulative detrimental soil condition percentages may be inflated.

Table 23 displays anticipated detrimental soil condition acres and percent of total by type of ground-disturbing activity. As can be seen, landings and ground-based activities (primarily skid trails) are predicted to generate the most detrimental soil condition. Landings would yield a total of 94 acres (3.7 percent) detrimental soil condition, temporary roads 6.5 acres (0.3 percent), helicopter logging 2.1 acres (0.08 percent), skyline logging 24 acres (1 percent), and ground-based logging 101.3 acres (3.9 percent).

Table 23. Total anticipated detrimental soil condition (DSC) by harvest type. Total activity area = 2,564 acres

Disturbance Type	Landings	Temporary Roads	Helicopter Logging	Skyline Logging	Ground-based Logging	Total
DSC Acres	94	6.5	2.1	24	101.3	227.9
Percent of Total	3.7	0.3	0.08	1	3.9	8.9

Appendix D of this EA shows detrimental soil condition and anticipated detrimental soil condition by activity for each unit. There are 25 units where there is expected to be over 20 percent detrimental soil condition after the proposed action takes place. These units would be mitigated by subsoiling landings, main skid trails, and temporary roads after harvesting activities take place. This soil remediation would reduce soil compaction, increase infiltration, and begin the process of reincorporating organics in these soils.

Forty-eight of the 80 proposed treatment units were analyzed in the field based on highest risk from the soil mapping. Therefore, units that were not field verified were estimated for their current percentage of detrimental soil condition. This was done by considering adjacent units and harvest history. The assumption was made that in similar topography with harvests being completed in a similar timeframe, these units would have similar detrimental soil condition to those that were field verified.

Some units had additional mitigation measures suggested (see Appendix D). These units were all field surveyed. The specific mitigations are detailed in Chapter 2. Unit 1257 contained some acreage of high erosion potential soils, which were proposed for mechanical treatment. Treatments in this unit were changed to skyline harvest upon consultation with the silviculturist.

Cumulative Effects

The cumulative effects analysis for the Traverse Creek proposed harvests considers past, present, and foreseeable future activities in the proposed treatment areas (see Appendix B for history of past management and road system development). Past projects were considered when current detrimental soil condition percentage was determined by field investigations. Past project effects include road construction, skid trails, and landings.

There are no ongoing activities that would contribute cumulative effects to soils. There are also no known future projects planned on National Forest lands for the activity areas. However, when they are planned and implemented, the aforementioned 20 percent detrimental soil condition guidelines will be followed, therefore not creating significant detrimental cumulative effects to the soil resource.

Stream Flow

Existing Condition

The hydrologic condition of the project area was assessed using the Aggregate Recovery Percent (ARP) method as described in the LRMP. This is a method for assessing the potential effects of past management (created openings) on runoff patterns by predicting the current vegetative condition of the landscape, and assessing the rate of snow accumulation and melt via rain and wind. The LRMP divided the landscape up into planning subdrainages based on the average drainage slope and percent of the area in the transient snow zone. Each subdrainage was then assigned a mid-point ARP value. This mid-point value is used as a threshold of concern; when current conditions or planned conditions drop below the mid-point value, there is the potential for an increase in peak flows, which may result in channel scour or streambank erosion. To take into account activities of private land, the ARP model was used to assess the condition within the Winberry Creek 6th-level HUC.

The thinning prescription is the same for both alternatives. While there is a difference in the acres in gaps and size of gaps between alternatives, (see the proposed action) gaps are discrete areas with one or more dominant trees or small groups of codominant trees left within the gaps, as well as hardwoods such as big-leaf maple and shade-tolerant species. These gaps are within thinned areas and would not function in the same way as a clearcut, and therefore, were not modeled as such. The ARP model assigns a rate of recovery to each stand planned for commercial thinning. The recovery curve for commercial thin uses a break of less or greater than 70 percent canopy closure. As both Alternative 2 and 3 thin below 70 percent canopy closure, no difference in alternatives is shown with this model.

Table 24shows that all subdrainages within the Winberry Creek HUC6 watershed, and the entire watershed are well above the assigned mid-point values, so it is unlikely that there will be any current peak flow issues. There has been little timber harvest within the federally managed portion of the Winberry Creek watershed (79 percent of the watershed area) for the last 15 years, allowing for the reestablishment of previously managed timber stands, and the attenuation of past management effects on flow.

Desired Future Condition

Management actions will not reduce the ARP values below midpoint concern thresholds.

Direct and Indirect Effects

Alternative 1. This alternative would not change the condition of any overstory vegetation. Existing stand conditions would continue to recover to hydrologically functioning condition. Stream flows would remain at near natural levels.

Alternative 2. Activities associated with the implementation of this alternative, specifically timber felling, and road construction, would reduce the ARP values as compared to the Alternative 1, the no action alternative (Table 24). However, these activities would not reduce ARP below the mid-point value under any alternative. Hydrologic recovery of the subdrainages would continue. Timber harvest and new temporary road construction would have some effect on the rate of snow accumulation and melt, however, it is estimated that this would only result in a very minor, non-discernible change in stream flows. Recovery of the treated stands would naturally occur with understory development and canopy closure expected in the years following the thinning. New road effects would be short term, as the roads would be closed following use.

In many instances, removal of more than 20 percent of the vegetative cover over an entire watershed would result in increases in mean annual water yield (Bosch 1982). Removal of less than 20 percent of vegetative cover has resulted in negligible changes, within natural variability of the system (ibid). As this project treats only 8 percent of the watershed, primarily through thinning, it is unlikely that a change in water yield would be seen.

Alternative 3. This alternative would have non-discernable effects on stream flows, similar to Alternative 2.

Table 24. Aggregate recovery percent (ARP) values for different alternatives

ARP Model Result	Existing Condition	Midpoint Value	ARP Condition After Project Implementation[1]		
			Alt 1	Alt 2	Alt 3
Lower South Fork	83	80	89	89	89
Monterica	85	80	91	91	91
North Fork Winberry	89	75	94	86	86
Brush	95	75	96	91	91
Winberry HUC6	84	78	90	87	87

1 ARP values are constantly recovering as previously harvested stands of trees grow and regain their hydrologic function. The values reported are the expected condition at a point in time 6 years from present, when projects would be completed or close to completed.

Riparian Reserves

Existing Condition

Approximately 40 percent of the 7,783 acres of riparian reserve in the Traverse Creek project area have been impacted by past management or natural disturbances. Field observations found that most riparian areas are shaded and recovering to a more natural condition.

Desired Future Condition

Continue to protect and enhance riparian condition and function. Implement restoration activities to accelerate recovery.

Direct and Indirect Effects

Alternative 1. This alternative would allow for the continued slow rate of recovery toward natural condition. No restoration would occur. Many of the plantations within the project area have riparian stands with overstocked plantation trees of uniform age, with limited diversity.

Alternative 2. This alternative would affect 1,161 acres of the riparian reserve network (Table 25) in previously managed stands. This is approximately 14 percent of the perennial riparian reserves and 22 percent of the intermittent riparian reserves within the project area. Thinning would increase the stand structural diversity and promote more vigorous growth of the riparian areas. The management proposed for the riparian areas would be carefully controlled to minimize any short-term negative effects, with the intention of increasing the health and vigor of the treated stands, allowing for a more rapid recovery toward natural condition. Trees in thinned riparian stands would grow to a larger size more quickly than untreated areas, therefore potentially providing larger-sized instream wood. Taller trees with broader canopies may provide more stream shade than in the untreated areas. The primary shade zone would not be thinned, which would leave many smaller trees to provide shade as well as future in stream

wood. The secondary shade zone would not be thinned below 50 percent canopy closure. Thinning would promote tree growth, providing broader canopies for shading as well as future large wood for nearby streams. One-acre gaps could occur within riparian reserves as long as they were at least 100 feet from the stream channel. No more than 15 percent of the project area would be in one-acre gaps.

Alternative 3. This alternative has the same acres of thinning as Alternative 2 but fewer acres of fuel treatment. The magnitude of effect to the riparian areas would be the same as that described for Alternative 2, and the long-term positive effects would be similar. One-acre gaps could occur within riparian reserves as long as they were at least 100 feet from the stream channel. No more than 20 percent of the project area would be in gaps.

Table 25. Riparian reserve acres and percent treated and not treated by alternative

Stream Category	Total RR Acres	Acres and Percentage of RR treated				
		Alt 1	Alt 2 & Alt 3		Not Treated under Alt2 & Alt 3	
		Acres and %	Acres	% Treated	Not Treated	% Not Treated
Fish bearing	1485	0	216	15%	1,269	85%
Perennial	4853	0	629	13%	4,224	87%
Intermittent	1445	0	316	22%	1,129	78%
Total	7783	0	1,161		6,622	

Water Quality Indicators

To determine effects to water quality, several indicators were measured: stream temperature and shade, turbidity, and chemical contamination. For each of these indicators, the existing condition and direct and indirect effects are described, and then cumulative effects of all three are presented.

Stream Temperature/Stream Shade - Existing Condition

The State of Oregon has established water quality standards set out in Chapter 340, Division 41 of the Oregon Administrative Rules. The waterbodies that do not meet water quality standards are called “water quality limited”. Such waterbodies are then placed on a list by the Oregon Department of Environmental Quality (ODEQ) in accordance with Section 303(d) of the Federal Clean Water Act (303(d) list).

The ODEQ summer temperature standard in the project area is 17.8 ºC (64 ºF) measured as an average of the daily maximum water temperatures over a seven day consecutive period.

In 1998, the ODEQ listed Fall Creek as water quality limited on the 303 (d) list due to temperatures above the standard during the summer period from river mile 0 to 7 and from river mile 13 to 32.7. This portion of the Fall Creek is also listed on the final 303(d) list for the year 2006.

Monitoring of stream temperature has occurred within the Winberry Creek HUC6 watershed. The 7-day maximum temperatures recorded from 1997 through 2003 are shown in Table 26. All of Fall Creek and Winberry Creek have been listed as water quality limited for temperature. A Water Quality Restoration Plan (WQRP) for waterbodies listed on the 303(d) list is required.

The Willamette National Forest has completed a WQRP for the four sub-basins of the Willamette Basin on the Forest including the Middle Fork oft the Willamette River sub-basin that includes this project area (USDA Forest Service 2008).

Table 26. Water temperatures for streams within the project area

Year	2007	2003	2002	2001	2000	1999	1998	
Stream Name	**Max. 7-day Avg. °C**	**Max. 7-day Avg. °C**	**Max. 7-day Avg. °C**	**Max. 7-day Avg. °C**	**Max. 7-day Avg. °C**	**Max. 7-day Avg. °C**	**Max. 7-day Avg. °C**	**DEQ Summer Temp Standard °C**
Brush Creek	16.5					15.2	17.6	17.8
Brush Creek Tributary	16.4							17.8
Minnehaha Creek	16.1							17.8
North Fork Winberry Creek	17.5	18.7	18.3	18.0	17.4	16.8	18.9	17.8
South Fork Winberry Creek	18.4	19.3	19.1	18.5	18.6	17.9	19.7	17.8
Monterica Creek	16.6							17.8
Cabin Creek	16.1					16.2	17.9	17.8
Traverse Creek	15.0							17.8
Blanket Creek	15.6					16.3	18.8	17.8

Temperatures within the project boundary have been impacted by past management allowing timber harvest to occur directly near the stream channel. Although harvest within the riparian reserve has impacted stream temperature, that natural geology of the watershed is also a key factor for current stream temperatures.

Both the North and South Forks of Winberry Creek typically have temperatures above the DEQ standard during the summer. The smaller streams in the project area are above the standard temperature during some years (typically hotter summers) and have temperatures that meet the standard during cooler summers (Table 26).

Stream Temperature/Stream Shade - Environmental Consequences

Direct and Indirect Effects

Alternative 1

Untreated riparian areas would continue to slowly recover from past management, and eventually riparian tree heights would provide maximum vegetative stream shade and water temperatures may be cooler over time.

Alternative 2

The effect that this project would have on stream shade was estimated using the model described in the “Northwest Forest Plan Temperature TMDL Implementation Strategies” (USDA Forest Service and USDI Bureau of Land Management 2005). This model provides the

process for calculating the width of the riparian area adjacent to perennial stream channels that provides stream shade for the period of greatest solar loading (between 1,000 and 1,400 hours), known as the primary shade zone. It also provides the process for calculating the width of the riparian area that provides shade in the morning and afternoon (0600-1000 hours; 1400-1800 hours), considered to be the secondary shade zone. In over-dense riparian areas, optimum shade can be provided by the primary shade zone alone, and the secondary shade zone may contribute little to shade since trees in the primary shade zone are already blocking the sun's solar radiation (USDA Forest Service and USDI Bureau of Land Management 2005).

The TMDL Implementation Strategies suggest that thinning in Riparian Reserves should be considered as long as they meet the following conditions:

- Vegetation density is high and will benefit from thinning.
- Vegetation thinning will not occur in the primary shade zone. Vegetation thinning in the secondary shade zone will not result in less than 50 percent canopy closure post harvest.
- Northwest Forest Plan standards and guidelines and BMPs still apply.
- The width of the primary shade zone will be set using the values below, unless a shade model is used for site-specific analysis.

A study of thinning treatments and the effects on stream temperature showed that thinning primary and secondary shade zones along 6 miles of stream lead to a 4 degree (F) increase in temperature (USDA Forest Service and USDI Bureau of Land Management 2005). Thinning only the secondary zone gave no measurable increase in stream temperature (ibid). There was about a one-degree change in temperature after one mile of thinning within the riparian area (ibid).

The width of the primary shade zone for units in the Traverse Creek Thin project area was set at 60 feet with the secondary shade zone ranging from 60 feet to the distance of one site tree. For maximum protection for the project, the no-cut buffers would be set at 60 feet for perennial streams. To encourage faster growth of trees within the riparian area, thinning would occur in the secondary shade zone. To protect the secondary shade zone, from 60 to 170 feet from a perennial stream canopy closure would be kept at an average of 50 percent or above. Gaps up to 1 acre in size may occur in the riparian area as long as they are at least 100 feet from the stream to add complexity to the riparian area. Given the protection of the primary and secondary shade zone, no increase in stream temperature is likely. In the long term, faster growth rates of the thinned stands would increase the shade density over time.

Alternative 3

The effect this alternative would have on stream temperature is the same as that described for Alternative 2. Primary shade zones would not be thinned. Secondary shade zones would be thinned to an average of 50 percent canopy closure and above. It is unlikely that there would be any loss of vegetation from within the primary shade zone for any perennial stream, or associated increase in stream temperature.

Turbidity – Existing Condition

Winberry Creek is flashy, meaning it rises quickly with increased rainfall. This can cause a rapid increase in stream volume and velocity in response to a storm. Winberry Creek is similar to the other creeks in the larger Fall Creek watershed in that it does become turbid rather quickly in response to a storm event, but it doesn't appear any more turbid than any of the other

6th-level watersheds in this area. Some of the project area roads are paved, and the road leaving the project area is paved. These roads would not contribute to increased turbidity. Due to the amount of valley bottom roads in this area and road 1802 that runs right along North Fork Winberry Creek, the existing road system has likely increased the amount of fine-grained sediment eroding into the stream network in any given time period, leading to turbidity levels that are higher than natural.

Blanket Creek and Brush Creek both have areas prone to debris flows and contribute to turbidity downstream. The headwaters of Minnehaha also have areas with high gradient debris chutes that contribute to turbidity during winter events. An ashflow tuff found at high elevations is a source for some of the cloudiness seen in the water of Brush and Blanket Creek during fieldwork in June 2008.

Turbidity – Environmental Consequences

Direct and Indirect Effects

Alternative 1

This alternative would result in the continuation of chronic sediment delivery to the stream network from existing road system and past road failures. Poorly maintained roads would continue to be at high risk of failure, potentially delivering large volumes of sediment to the stream network and leading to periodic pulses of high turbidity. Turbidity levels increase naturally in many streams during high flows and natural fluctuations would be expected (Gomi et al. 2005).

Alternative 2

Timber Harvest - Proximity of ground disturbance to streams is an important factor controlling sediment delivery (Rashin et al. 2006). Given that stream no-cut buffers are at least 60 feet on perennial streams and 30 feet on intermittent, it is unlikely that measurable sediment would be delivered to the streams from harvest activities associated with this project.

There would be from 10 to 15 stream crossings on perennial streams and 15 to 20 on intermittent streams. Where yarding corridors cross streams, they would require full suspension yarding. Corridors are well spaced and thinning prescriptions would leave down wood and are not likely to expose mineral soil. The no-harvest buffers would prevent any overland transport of soil from reaching stream channels.

Culvert Replacement - Four culverts need to be replaced on perennial streams and 27 on intermittent streams. The two most important sites are on road 1802 at crossings of Brush Creek and Traverse Creek. Culvert replacement at Brush Creek would be done during the instream work window designated by the State and would follow a strict dewatering plan. There is approximately 6 feet of fill at this site along the sides of the outside culverts and almost no fill at the highest point of the culverts. For such a small amount of fill, it would be unlikely that even 1/4 of a yard of sediment would be added to the stream. Immediately after the work occurs and during the first winter after completion of the culvert replacement, sediment loosened by the culvert work, may enter the stream channel and travel to Winberry Creek leading to a minor increase in local turbidity locally for the duration of the first few storm events. Larger sediment sizes would become trapped by large wood in the stream while the finer particles would be carried downstream.

Higher in the watershed there is a culvert on road 1802 that crosses Traverse Creek. This culvert has already failed and needs to be replaced. There is approximately 45 feet of fill over this culvert. BMPS would be used to limit the potential for sediment input to the stream from the fill; however, given the depth of the fill, 0 to two yards could potentially enter the stream over the first year after the work is complete (Tennis, pers. comm. 8-27-08). This is the largest fill on any of the culverts being replaced. While the gradient averages 13 percent for this reach of Traverse Creek, there is an abundance of large wood available to trap the sediment. Most of the larger sediment would be trapped within 500 feet of the culvert by the abundant wood found in this stream while the fine sediments would be carried downstream.

Road Maintenance and Reconstruction - Road maintenance such as blading, ditch work, and brushing, and reconstruction that would add culvert replacement and asphalt repair would happen throughout the area prior to haul. BMPs required for this work would greatly reduce the magnitude of turbidity increases, but would likely not eliminate all sources. Road blading and the addition of rock would coincide with road use (wet and dry season haul) and current condition. This alternative would improve water drainage on the existing road network, reducing sediment delivery to streams, and subsequently reducing the periodic increases in stream turbidity.

Log Hauling - The amount of sediment eroded from the road surface depends on many factors including the amount of traffic, the durability of the aggregate, road maintenance, the condition of the ditchlines and the amount of precipitation. Wet weather haul would be allowed on 37.6 miles of paved and aggregate surfaces roads. Aggregate surfaced roads used for winter haul were surveyed and it was determined that with pre-haul reconstruction and maintenance, haul on these roads would result in only a minor increase in fine-grained sediment movement off road surfaces (Traverse Creek Engineering Report). Drainage would be adequate to prevent most of this material from entering the stream system, with additional ditch relief culverts installed where needed. Additional surfacing would be added to aggregate surfaced winter haul routes, reducing the probability of sub-grade exposure through rutting. BMP, R-20 (Traffic Control During Wet Periods) would be incorporated into the timber sale contract, which would allow the timber sale administrator to stop log hauling if and when the hauling results in the delivery of sediment to streams. Sediment routing would be reduced by silt fencing or straw bales (or similar) if monitoring reveals any areas of concern. To minimize turbidity, hauling would not be permitted during rainy season of November 1 to May 31 on native surfaced roads, and other identified aggregate surfaced roads that have a higher potential for sediment delivery to streams.

Temporary Road Construction - New temporary road construction would not result in any increase in turbidity because there would be no hydrologic connections between the new roads and streams.

Alternative 3

The effect on turbidity would be similar to that described in Alternative 2 with fewer miles of road reconstruction. With less reconstruction, there would be less risk of short-term (1 year) effects of sediment movement from road work. Long term there would be greater risk of road failure in areas needing, but not receiving, reconstruction.

Chemical Contamination – Existing Condition

There are no known point sources of contamination within the watershed or the project area. However, proposed activities would involve vehicles and equipment that use petroleum products and other potentially toxic fluids.

Chemical Contamination – Environmental Consequences

Direct and Indirect Effects

Alternative 1

Since there would be no project activities, there would be no direct or indirect effects

Alternatives 2 and 3

BMPs would be in place to protect streams from fuel and other petroleum products. Refueling must occur at least 150 feet from any stream. BMPs implemented for other sources with all action alternatives such as requiring fuel spill kits and requiring buffers between streams and fuel storage/filling sites would greatly reduce the probability of a spill that would contaminate water or impact fishery resources. Past monitoring of this type of activity has shown that spills rarely occur. It is expected that this project would have no effect on this indicator.

Cumulative Effects to Water Quality

For the cumulative effects discussion of the water quality indicators, both the Winberry 6th-level watershed and the larger Fall Creek 5th-level watershed were analyzed. Existing conditions are a result of past management and these effects have been described above. No additional federal management actions are planned in the foreseeable future in the Winberry watershed; therefore, cumulative effects to water quality indicators would be greatly limited. The 28 percent of the Winberry 6th-level watershed in private land would continue to be harvested with approximately 40-year rotations. The Oregon Forest Practices Act regulates harvest on private land.

For the larger Fall Creek 5th-level watershed, the most recent Forest Service timber project is the Hehe LSR Thinning Project along the upper part of Fall Creek and along Hehe Creek (see project listing in Appendix B). All ongoing timber projects besides the Fall Creek SIA are commercial thinning projects (see Appendix B) and leave riparian no-cut buffers. The Fall Creek SIA includes the work related to the Clark Fire that burned directly along FS route 1800 within the primary and secondary shade zones of Fall Creek. Effects from the ongoing projects would average between 5 and 20 years after completion of the projects. The 18.5 percent of the Fall Creek watershed in private ownership is low in the watershed and along Fall Creek, however this private ownership is mostly residential. Given the large amount of federal ownership in the watershed, little cumulative effects on water quality indicators would result from management on the private land.

The Fall Creek SIA had to remove approximately 45 large, high-rated hazardous trees in the primary and secondary shade zones. Trees removed contributed approximately 3 percent of the total large trees within the zone from 0 to 100 feet from the edge of Fall Creek. It is estimated that the trees removed contributed approximately 0.7 percent of the total potential stream shade. The loss of this small percent of potential shade would not result in a measurable increase in stream temperature over the stream reach (Johnson 2004). All alternatives in Traverse Creek Thin Project would retain suitable riparian buffers and canopy cover would have no cumulative effects to stream temperature in Fall Creek HUC5 watershed.

Alternative 1

Current sediment delivery from degraded road systems would continue to increase stream turbidity. Stream crossings that are not properly maintained can plug and fail and cause debris torrents and delivery of sediment and road fill material to the stream channels. A lack of maintenance can also lead to increased ditch flow, where adequate cross drain culverts do not exist or are not maintained ditch flow can dig and travel long distances to stream channels also increasing turbidity. Existing roads along the valley bottoms persist with very little road maintenance, chronic sediment delivery would continue. Overstocked riparian reserve stands would continue to recover over a long period of time and stream temperature would slowly decrease as the stands grow.

Alternative 2

Due to extensive road reconstruction, Alternative 2 would result in long-term improvement in road conditions. Closing an additional 3.96 miles of road would also lower the risk of road failure on these roads.

Treatment of the riparian reserves would increase habitat diversity, retaining shade and high tree densities in the primary shade zone to provide small to medium size in-stream wood. Over time, the riparian reserves in the secondary shade zone would reach old growth characteristics more quickly than unthinned stands providing additional stream shade and potential large woody debris.

Alternatives 3

Alternative 3 proposes fewer acres of fuel treatments, road work and road closures. This alternative would do less to lower risk of road failures. As the silviculture treatments are the same as for Alternative 2, treatment of riparian reserves would improve function as stands reach old growth characteristics and as a result provide more large potential large woody debris and provide additional stream shade.

Stream Structure Indicators

To determine effects to stream structure, several indicators were measured: instream and riparian wood, channel substrate and fine sediment, and features that contribute to channel complexity. For each of these indicators, the existing condition and direct and indirect effects are described, and then cumulative effects of all three are presented.

Instream/Riparian Wood - Existing Condition

Field reviews and stream survey data indicate that tributary streams in the Winberry HUC6 watershed have between 67 and 143 pieces of instream wood, although the mean piece size is often small. Large-sized instream wood is infrequent, especially in the riparian areas previously impacted by timber management. Cabin Creek, Monterica Creek, and the North and South Forks of Winberry Creek have the least amount of large wood. The tributary to Brush Creek has the largest amount of wood. Past timber harvest and road locations have reduced the total amount of trees available for recruitment to the stream network. There have been many stream restoration projects within the Winberry watershed to add wood and large boulders to the streams. There were recent additions of wood in 2007 that added key pieces of wood to the North and South Forks of Winberry Creek and to Traverse Creek. Streams in this area tend to respond quickly to rainfall events, with rapidly increased stream volume and energy. This produces a high level of stream energy that rapidly transports smaller woody material out of the watershed unless held by the larger key pieces.

Instream and Riparian Wood – Environmental Consequences

Direct and Indirect Effects

Alternative 1

There would be no change from existing conditions. As trees grow and fall, wood would be added to the streams.

Alternatives 2 and 3

In the short term, the smaller woody debris would continue to fall from within the untreated stream buffers of 60 feet for perennial streams and 30 feet for intermittent streams. Overtime, larger wood would begin to be recruited from farther up the slopes as the treated stands reach heights of 200 feet. Thus, wood with a larger range of sizes would potentially be recruited into streams over the long term in treated stands. As short-term recruitment of the existing large woody debris is expected to be maintained, the proposed actions are not expected to cause short-term effects to fish habitat at the site or downstream. In the long term, the increase in the size of trees in riparian areas could beneficially affect large woody debris recruitment to the stream channel, thus potentially improving the quality/complexity of aquatic habitat adjacent to the treatment areas in the future.

Channel Substrate and Fine Sediment Component - Existing Condition

Stream surveys occurred in 2007. Table 27 in the Aquatics Report (Thornton, Vanosdall and Walters 2008) gives the size of the substrate at the time of survey. Brush Creek and Minnehaha Creek were the only streams with over 10 percent fines. The Brush Creek tributary has large amounts of large wood and fine sediments and is naturally prone to debris torrents.

Determining a measure of the fine sediment component of a stream channel is difficult. Measurements to quantify stream channel substrate at specific locations are possible, but may not represent an accurate picture of the larger system or stream reach. This picture of channel substrate would also be limited by the time and conditions when measurements were taken. The dynamic nature of the stream systems contradict our ability to quantify specific baseline information with regard to channel substrate/fine sediment within the system knowing that what we measure today will not be what we measure tomorrow. With this understanding, it is important to try to quantify the impacts of our actions by alternative and understand our limitations in describing how that compares/relates to existing conditions.

Channel Substrate and Fine Sediment Component – Environmental Consequences

Direct and Indirect Effects

Road Maintenance

Road maintenance, blading, ditch work, brushing and the addition of ditch relief culverts would happen throughout the area prior to haul and is not expected to result in a change in stream channel substrate. Capturing fine sediment mobilized as a result of road work and winter haul is the anticipated outcome of road/ditch disconnection to stream channels.

Alternative 1

Channel substrate would continue to be affected by existing chronic sources of fine sediment input from problem roads. Stream velocities would remain high during precipitation events, effectively transporting smaller-sized substrate from the watershed. As the watershed recovers

slowly over time, channel complexity may increase with the recruitment of instream wood in the main stream channels, potentially allowing for an increase in the substrate complexity.

Alternative 2

This alternative could cause a short-term increase in the delivery of fine-grained sediment to the stream network primarily from the haul roads. Specific mechanisms for the positive and negative effects are discussed earlier in this document under the turbidity indicator. The reconstruction of FS road 1802, immediately adjacent to North Fork Winberry Creek has a high potential to result in increased sediment delivery to Winberry Creek. BMPs would limit the amount of sediment delivered from the work sites but some sediment could be added at each site, particularly following the first heavy rain. It is estimated that there would be a short-term increase in fine-grained sediment where the culvert replacements occur. Because of the timing of the culvert replacement work and the extensive implementation of BMPs, it is unlikely that there would be a discernible change in substrate composition after project implementation and the first few precipitation events. Over the longer term, it is expected that the road improvements would reduce delivery of sediment to streams.

Alternative 3

The effect associated with this alternative would be similar to Alternative 2 with a short-term increase in the delivery of fine-grained sediment to streams from additional use on haul roads. Unlike Alternative 2, this alternative does not close any additional roads and does less road reconstruction. Fewer long-term improvements are associated with this alternative.

Additional Channel Complexity Features – Existing Condition

Other channel complexity features include pool frequency/quality, streambanks, width-depth ratio, floodplain, and side channels. Winberry Creek and its tributaries have simplified channel structure partially from its natural characteristics, low levels of instream wood, and high-energy runoff that easily mobilizes recruited wood and channel substrate. Stream improvement projects have occurred for many years adding large wood and boulders to the streams in the area. Many of the streams are constrained by roads that run along one side in the narrow valleys.

Additional Channel Complexity Features – Environmental Consequences

Direct and Indirect Effects

Alternative 1

This alternative is not anticipated to affect stream channel complexity features. The stream channels would continue to change during high-flow events and stabilize in a cyclical and dynamic way depending on rainfall and wood recruitment events. The lack of road maintenance would continue to allow unnatural levels of fine sediment that could degrade pool habitat and potentially reduce pool frequencies.

Alternatives 2 and 3

With Alternative 2, road reconstruction and maintenance would increase sediment delivery rates in the short-term, potentially filling in pool habitat immediately downstream from the work sites. However, this work is designed to greatly reduce the potential long-term sediment delivery rates, and reduce the existing chronic sediment sources. Therefore, in the long term, it is expected that this alternative could potentially increase pool frequencies, improve pool quality and have a positive effect to this indicator. Closing roads could also cause short-term

increases in sediment, particularly where culverts are pulled. Closing roads lowers the long-term risk of road failures associated with storm events. In the long term, thinning in the riparian area increases the quality of potential stream recruitment trees, providing larger key pieces of wood that will help capture smaller wood pieces, resulting in complex woody material jams.

Effects of Alternative 3 would be similar to those described for Alternative 2 without the positive effects from road closures.

In-stream structure placement of large woody debris on North Winberry Creek could occur if revenue from the proposed timber sale is sufficient to fund such a project (see Appendix C). Separate environmental analysis would be completed for this project prior to implementation.

Cumulative Effects to Stream Structure Indicators

For the cumulative effects discussion of the stream structure indicators, the Winberry 6th-level watershed was analyzed.

Alternative 1

Cumulative effects generated from the no action alternative would be the slow recovery of bank stability, wood recruitment rates and instream wood. Without additional road work, there is greater potential for degradation of pool habitat from chronic sediment sources, including deteriorating roads.

Alternatives 2 and 3

The past management activities summarized in Appendix B have resulted in the current stand conditions in the proposed treatment units and the road system presently in place. It also explains the road-related sediment delivery presently occurring. Effects of the past along with expected effects of Alternative 2, would likely result in short-term increases in sediment delivery from sources and causes previously described in this section.

Alternative 2 includes the most road work and road closures. Therefore, this alternative has the most potential for long-term improvement in stream structure indicators due to 1) thinning in the riparian area, which in the long-term would lead to more larger trees available in the riparian area for potential large wood; 2) large amounts of road work to help “storm proof” the road within the project area (45 percent of the watershed), and 3) road work and decommissioning roads, which lowers potential for future road failures.

Alternative 3 has similar effects as Alternative 2, with somewhat less road work and no additional road closures.

Fisheries Resources

To determine effects to fisheries, several indicators were measured: fish species presence, distribution, and isolation; fish habitat condition and refugia; fish growth and survival, and fish population size, density, hatchery influences, and non-natives. For each of these indicators, the existing condition and direct and indirect effects are described, and then cumulative effects to all the indicators are presented.

Fish Species Presence, Distribution, and Isolation - Existing Condition

Fish presence/absence surveys have been recently conducted for all perennial streams throughout the Winberry Creek HUC6 watershed. These surveys documented management

indicator aquatic species in Traverse Creek, (rainbow trout and cutthroat trout), South Fork Winberry Creek (rainbow trout, cutthroat trout and sculpin), North Fork Winberry Creek (cutthroat trout and rainbow trout), Monterica Creek (juvenile trout and Pacific Giant Salamander), Minnehaha (juvenile trout), Cabin creek (cutthroat trout), Buck Creek Tributary (juvenile trout) and Brush Creek (juvenile trout). No aquatic species were observed in Blanket Creek.

There are no native anadromous fish in the project area, however Chinook salmon are found approximately 3.5 miles downstream in Winberry Creek. Migration of anadromous fish is partially restricted by the presence of Fall Creek dam, located approximately 15 miles downstream from the project area. Upstream migration past the dam is facilitated by the U.S. Army Corps of Engineers via trap and haul, and continued distribution of these fish is dependent on this effort. Fry mortality through the dam is approximately 0 to 10 percent while juvenile mortality ranges between 10 to 50 percent depending on flow (Lewellen and Ellingson 2007).

All potential habitats for MIS-resident fish within the project area is currently accessible and utilized, with the exception of one existing culvert in North Fork Winberry Creek that blocks the upstream movement of juvenile trout during low flows. All other migration barriers are natural waterfalls.

Fish Species Presence, Distribution, and Isolation – Environmental Consequences

Direct and Indirect Effects

Alternative 1

Fish would likely continue to use the streams within the project area. The existing fish barrier culvert on Road 1802, where it crosses Brush Creek, would not be replaced, and would continue to limit upstream movement of cutthroat trout.

Alternatives 2 and 3

Fish would likely continue to use the streams within the project area, with similar species distribution. Adverse effects to fish habitat would be localized, and minor in magnitude, with no long-term loss of habitat. The existing barrier culvert would be replaced on Brush Creek, increasing available habitat to cutthroat trout.

Fish Habitat Condition, Refugia – Existing Condition

The conditions described under Watershed Scale Indicators, Water Quality Indicators, and Stream Structure Indicators provide a description of the existing hydrological condition. This section relates the hydrologic condition to the condition of the fish habitat.

Watershed Disturbance: Approximately 64 percent of the area has been harvested in the past and these areas now exist as young managed plantations, leaving about 36 percent of the area in native stands. Watershed conditions are slowly recovering from past management. Fish habitat condition in most tributary streams is functional, with reduced habitat quality in Blanket Creek and SF Winberry Creek.

Road System: The existing road system contains one barrier culvert. Road-related increases in fine-grained sediment is likely causing a site scale loss of interstitial space and spawning

substrate embeddedness. This reduces the quality or abundance of habitat for young fish, and may reduce the available food supply for fish.

Stream Flow: Existing flow levels are likely near natural rates. Fish are not affected.

Riparian Reserves: Current riparian disturbance levels are high in lower reaches based on past management. However, natural recovery is progressing in most areas, and riparian processes of wood delivery, sediment retention, and stream shading are returning to pre-disturbance levels.

Temperature: All of Winberry Creek has been listed as water quality limited for temperature. All of the project area streams, except Traverse Creek are above the preferred temperature levels for optimum fish survival for juveniles and all are above preferred adult migration/spawning temperatures (see Table 29 of the Aquatics Report).

Turbidity: Existing levels of turbidity are higher than natural. Road failure sites may temporarily increase turbidity levels, causing displacement of fish, reduced feeding success, and other negative behavioral changes.

Chemical Contamination: No sources of contamination are present. Fish are not affected.

Wood: Within the upper tributary stream reaches, existing instream wood levels are high, providing high quality fish habitat. Abundant wood provides important habitat characteristics for fish by allowing the sorting and storage of substrate, providing stream hiding cover and flow refugia areas, and creating pool habitat. The natural wood levels in the lower reaches of many of the larger streams including Blanket Creek, Brush Creek, Cabin Creek, NF Winberry Creek, and SF Winberry Creek have been impacted by past management. However, wood has been added to many of the reaches under a fish habitat improvement project and fish habitat appears to be good as a result.

Substrate: Currently there are few areas where substrate embeddedness or high percentages of surface fines exist. Channels scoured to bedrock are present in Blanket Creek, Cabin Creek, Monterica Creek, SF Winberry Creek, and Traverse Creek. These areas typically provide less than optimum fish habitat.

Channel Complexity: Winberry Creek and Fall Creek have simplified channel structure partially from its natural characteristics, low levels of instream wood and high-energy runoff that easily mobilizes recruited wood and channel substrate.

Fish Habitat Condition, Refugia – Environmental Consequences

Direct and Indirect Effects

Alternative 1

This alternative would allow for the slow recovery of riparian and stream conditions. Chronic and episodic inputs of sediment from the existing road system would not be reduced and could result in negative effects to fish.

Alternative 2

The analysis of effects to water quality indicators earlier in this document determined that there would be minor negative effects to stream turbidity and channel substrate. Effects to turbidity

and sediment are primarily caused by road work and log hauling. Turbidity increases may displace salmonids, or affect feeding rates. Increased fine-grained substrate may result in the loss of interstitial space between larger stream substrate material (gravels and cobbles), reducing the quality or availability of fish rearing habitat. Added fine substrate to fish-bearing streams may result in covering of redds which reduces oxygen flow and could potentially reduce the egg-fry survival rate. These effects would be short term in nature, with a longer-term positive effect primarily due to road closure.

Because of the timing restrictions and BMP implementation, culvert replacement work is unlikely to result in a discernible change in substrate composition in the short-term. Long-term reductions in sediment input are expected as a result of road improvements.

Short-term recruitment of existing large woody debris is expected to be maintained. The long-term increase in the size of trees in riparian areas as a result of thinning could beneficially affect large woody debris recruitment to the stream channel, potentially improving the quality/complexity of aquatic habitat adjacent to the treatment areas.

Given the protection of the primary and secondary shade zone, no increase in stream temperature from proposed activities is likely.

Alternative 3

Effects to the fish resource would be similar to those described for Alternative 2. There would be a lower level of sediment delivered to fish-bearing streams with this alternative as a result of road reconstruction. In the longer term, the proposed work with this alternative would lead to a reduction in the chronic sediment delivery rate, and a large reduction in the potential volume of sediment that would be delivered during an infrequently occurring precipitation event, or road drainage failure. Planned improvements to the road drainage system would greatly diminish the risk of this occurring. The effect to wood level and temperature would be the same.

Fish Growth and Survival – Existing Condition

Field examination of fish within the Winberry watershed show relatively high densities of native fish. Natural production is successful at maintaining viable populations.

Fish Growth and Survival – Environmental Consequences

Direct and Indirect Effects

Alternative 1

This alternative would have no immediate effect on fish growth or survival. Over the long-term, lack of road maintenance may result in large depositions of fine substrate, which would result in the loss of fish habitat, reduced spawning success, reduced fish fitness, and subsequent survival and even increased mortality depending on the size and location of the road failure.

Alternatives 2 and 3

Alternative 2 may result in a slight negative effect to fish growth rates. Effects of sediment to fish are based on two key components, the concentration of the sediment and the duration of exposure (Macdonald and Newcomb 1991). The most sensitive life stage for salmonids is the egg and fry stage during the incubation period, juvenile and adult life stages are more resilient to sediment effects (Anderson 1996). Because sediment generated is predicted to be both of low concentration and short duration of exposure, there would likely be no mortality

experienced to juvenile or adult life stages. These life stages would alter their locations to avoid the stressor and because sediment is predicted not to travel great distances, displacement would be very limited. The incubating process for egg and fry life stages could be affected slightly in the short term, which could generate a very slight decrease in survival rates. Increased turbidity levels may negatively affect the ability of fish to feed. Loss of interstitial space and fine sediment deposition may affect egg-fry survival in redds, and juvenile entrapment in channel substrate (Chapman 1988). Long-term, road closure would result in a reduction in the potential volume and frequency of sediment inputs, leading to positive effects for fish.

Alternative 3 would have similar impacts to Alternative 2. However as no additional road closures occur, the long-term beneficial effects associated with road closures would not occur.

Fish Population Size, Density, Hatchery Influences, Non-Natives – Existing Condition

Data on the trend in fish numbers or densities is not available for most fish species. Observed densities of cutthroat trout seem to be similar to other watersheds throughout the Middle Fork Willamette Ranger District.

Fish Population Size, Density, Hatchery Influences, Non-Natives – Environmental Consequences

Direct and Indirect Effects

Alternative 1

Fish population numbers would likely continue to be maintained at current levels. This alternative doesn't upgrade existing problem roads, and therefore chronic and/or episodic sediment delivery from unstable road systems would continue to slightly depress the survival rates of fish in habitat near these roads, potentially leading to a slight reduction over time in the population size.

Alternatives 2 and 3

Both action alternatives would likely result in a very minor reduction in fish population numbers immediately following project implementation, due to the potential for reduced survival during the incubating process associated with increased sediment delivery. Longer term, habitat conditions would improve, and population numbers should slowly increase until carrying capacity is reached.

Cumulative Effects to Fisheries Resource

For the cumulative effects discussion of the fisheries resource indicators, the entire Winberry 6^{th}-level watershed was analyzed. Existing conditions are a result of past management and these effects have been described in the Watershed Scale Indicators section. No additional federal management actions are planned in the foreseeable future in the watershed and as a result would greatly limit the cumulative effects to fisheries indicators. Private land would continue to be harvested on an approximately 40-year rotation.

Please refer to Water Quality section above for an overview of cumulative effects for the larger Fall Creek 5^{th}-level watershed; these effects would apply to the fisheries resource also.

Alternative 1

Cumulative effects to MIS resident and anadromous species, including ESA listed spring Chinook salmon downstream of the project area, would primarily include effects from ongoing road maintenance. Due to lack of funding, not all roads would be maintained and current unnatural sediment rates being generated from degrading road systems would continue to effect growth and survival rates resulting in a potential slight decrease to all MIS populations within the Fall Creek HUC5 watershed. MIS fish populations would maintain at current levels.

Alternative 2

Cumulative effects to MIS resident and anadromous species, including ESA listed spring Chinook salmon downstream of the project area, would include long-term reduction of unnatural turbidity rates due to aggressive road closure and decommissioning. This would greatly reduce unnatural levels of sediment delivery to the Winberry watershed. Large wood placement from both the Fall Creek SIA and Hehe LSR Thin along with improved stands within the riparian reserve in the project area would have long-term positive cumulative effects by increasing overall stream conditions and complexity within the Winberry Creek 6th-level watershed. This would create additional and higher quality fish habitat. Cumulative effects generated from Alternative 2 in conjunction with ongoing projects would not cause any long-term negative effects to MIS fish populations within the Winberry Creek watershed. Although a small decrease in fish populations may occur directly after project implementation, the above cumulative effects would benefit all MIS species by increasing population size above pre-project implementation.

Alternative 3

Cumulative effects to MIS resident and anadromous species, including ESA listed spring Chinook salmon downstream of the project area, would primarily consist of degraded road systems within the project area that would not be treated and over the long term continue to produce unnatural rates of turbidity within the Winberry Creek watershed. Large wood placement from both the Fall Creek SIA and Hehe LSR Thin along with improved stands within the riparian reserve in the project area would have long-term positive cumulative effects by increasing overall stream conditions and complexity within the Winberry Creek 6th-level watershed. This would create additional and higher quality fish habitat. Cumulative effects generated from Alternative 3 in conjunction with ongoing projects would not cause any long-term severe effects. Due to continued unnatural rates of turbidity being delivered into fish habitat within the Winberry Creek watershed, all MIS fish populations would continue to be impacted; in the long term, fish populations would continue to maintain at current levels.

Sensitive Plants and Rare and Uncommon Botanical Species

Methodology

Forestwide databases, watershed analysis reports, in addition to field surveys conducted in summer of 2007, were used to identify specific locations with respect to treatment areas. Presence of rare and uncommon and sensitive species formed the basis for evaluating effects. The scale for analysis for direct and indirect effects includes the project area. Haul routes are also evaluated for effects in the weeds section of the report. The spatial scale for cumulative effects includes the Fall Creek watershed. The project area (Winberry subwatershed) represents

approximately 11 percent of this analysis area. This spatial analysis area was chosen because it likely contains additional rare and uncommon and sensitive species and sites similar to those suspected to be in the Traverse Creek Thin Project and helps further define the local relative degree of rarity of species. The temporal scale for this analysis is 10 to 20 years because this likely represents the time period in which adequate data is available for known occurrences within the areas as well as time periods for re-establishment if impacted in the past.

Existing Condition

Habitat exists in the project area for 61 of the 72 botanical species listed as sensitive on the Forest. Pre-field review identified two sensitive species (*Frasera umpquaensis* – four occurrences and *Romanzoffia thompsonii* – two occurrences) approximately 2.5 miles east of the project area. Field surveys within the project area resulted in documentation of two sensitive lichen species. Three occurrences of *Usnea longissima* were identified in conifer trees above the forest canopy floor and 17 occurrences of *Peltigera pacifica* were identified on rocks, moss, and rotting logs and/or limbs in mesic and riparian areas within seral to midseral conifer stands.

No vascular plants of bryophytes were documented in surveys. No surveys were conducted for fungi because of infeasibility or single season surveys.

Environmental Consequences

Vascular Plants

No direct or indirect impacts to sensitive vascular species are anticipated in any of the alternatives because no threatened, endangered, sensitive, or rare and uncommon vascular species were found.

Lichens, Bryophytes and Fungi

Direct and Indirect Effects

Alternative 1

Under this alternative, no acres would be thinned and the stands would undergo a slow decline before opening up enough to provide an understory. An indirect effect of no action would be natural succession, which may change the underground species composition. Windthrow, trees knocked down by snow (which occur to some degree in the watershed), and insect and disease pockets would create openings. Coarse woody debris would be abundant as trees die due to overcrowding. Indirect effects to sensitive fungi would likely be minimal. As stands get older, the underground species composition also gets more diverse (Visser 1995; Bradbury et al. 1998; Smith et al. 2002).

The stands do provide potential habitat for many sensitive botanical species. Potential habitat for some of these plants would deteriorate as the dense canopies of Douglas-fir close in and darken the forest floor. Some species may be negatively affected by development of a dense closed canopy. These species must have adequate light to photosynthesize; also, a deep dark canopy tends to favor greater moss cover, which can outcompete the lichens. Species associated with shrubs and hardwoods such as bigleaf maple would likely drop out of the stand unless thinning takes place.

Alternative 1 would not result in soil disturbance, compaction or alteration of microclimates and therefore would have no direct effect on lichen, bryophyte, fungi or other species habitat.

Conversely, because no fuels treatments would occur, heavier unmanaged fuel loads would persist, which increases the risk of a stand-replacing fire event. If such a fire occurred, this alternative could indirectly affect potential sensitive plant habitat.

Effects Common to Alternatives 2 and 3

Effects to rare and uncommon and sensitive lichen, bryophytes and fungi species and their habitats vary. Two studies have shown that fungal species richness declines in forest openings (Durall et al. 1999, Kranabetter and Wylie 1998). Therefore, in the short term, thinning prescriptions proposed in both action alternatives may reduce habitat for sensitive mycorrhizal fungi. The prescriptions in all action alternatives anticipate enhancement of existing stands that create late-successional characteristics over the long term. This includes greater diversity in stand structure and stand species. The addition of understory trees and shrubs may benefit the sensitive mycorrhizal species. Duff retention and coarse woody debris creation would benefit the sensitive saprophytic species and would lead to an increase in habitat complexity over the long term (20 to 100 years).

Changes in hydrology, including water temperature and sediment may affect aquatic lichens found on submerged rocks in clear, cold streams (USDA Forest Service, USDI Bureau of Land Management 2003). Persistence of the other lichen species may be threatened by host tree removal, wind throw, changes in microsite conditions, changes in epiphyte ecology and competition in more open stands, and by dispersal limitations in more widely spaced stands (ibid.). The variable thinning prescriptions would, in the long term, enhance habitat for most rare and uncommon species. In some cases, thinning may be beneficial to these epiphytes by enhancing tree species diversity, including Pacific yew and hardwoods such as bigleaf maple, two tree species known for their abundant lichen communities. Larger diameter trees, retention areas, dominant tree release, and the retention of minor tree species would add complexity to the forest. Late-successional forest provides better habitat for sensitive lichens through retention of mature and old-growth trees providing long-term substrate and microclimates. All alternatives propose riparian thinning which increases potential impacts to many species more typically associated with riparian habitat. Mitigation measures as described in Chapter 2 of the EA describe protection buffers on all stream classes associated with action alternatives.

Direct effects to fungi and ground-dwelling lichens under all action alternatives are likely to occur from activities associated with thinning, but severity and amount of habitat disturbance differs by yarding system, thinning prescription and mitigation measures. Most fungi 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). Stand treatments would result in the disruption of mycelial networks (Kranabetter and Wylie 1998; Amaranthus and Perry 1994). 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 (ibid). Ground-based and skyline yarding systems are proposed in the action alternatives. Although skyline yarding causes fewer disturbances to the top soil horizons than tractor yarding, and soils are less likely to become compacted with partial (or full suspension) skyline yarding than ground-based systems, some direct ground disturbance and soil compaction can occur with both systems. These systems can cause direct uprooting and removal of lichens, localized soil compaction, loss of ectomycorrhizal root tips (Amaranthus et al. 1996) and can disturb litter-dwelling and saprophytic fungi along yarding corridors.

Culvert replacement may cause some disturbance to soil-dwelling fungi and ground-based lichens through direct disturbance and potential removal of habitat, but these effects are

generally restricted to small, localized areas. Development of temporary access roads, road maintenance, closure and decommissioning, and helicopter landing areas would have a similar localized direct effect on fungi in the soil and ground-based lichens.

No underburning or broadcast burning is proposed within the project area, however, pile burning of slash material is expected on some landing sites. Effects of burning on fungi have been the subject of many scientific investigations. Loss of large downed woody debris that can act as moisture reservoirs and refugia is a concern (Penttila and Kotiranta 1997). Bruns (2002) studying short-term effects of ground fire in the Sierra Nevada found a short-term reduction in the biomass of ectomycorrhizal fungi correlated with incineration of the litter layer, but found lower layers, where the greatest species richness occurs, were preserved. Stendell et al. (1999) found a similar pattern in a Sierra Nevada ponderosa pine forest after prescribed fire where litter and organic species biomass decreased eightfold but no difference was detected in mineral layers. It is expected that similar effects to ground-based lichens would be similar to the impact on fungi in that loss of moisture reservoirs, litter layers and substrates would impact these species. Recommendations for minimizing impacts from burning activities to upper tree canopy dwelling lichens include keeping flame heights as low as possible, and implementation of a 50-foot buffer between species occurrence and the burn site (Torren and Niles 2003).

Effects Specific to Alternative 2

No impacts to *U. longissima* are expected because protection buffers would be implemented around known occurrences to ensure retention of microclimatological factors that protect this species.

Protection buffers for *P. pacifica* would vary from 0 to 170 feet (see Mitigation Measures in Chapter 2), depending on locations of occurrences, treatment needs, and site conditions. Protection buffers of 170 feet are designed to fully protect microclimatological features associated with this species from any impacts (Juillert 2008). Reduction of buffers on 11 of the 17 documented occurrences of *P. pacifica* would result in a short-term decrease of approximately 13.5 acres of potential habitat protection areas (full protection area is 35.5 acres) in Alternatives 2 and 3 compared to the no action alternative. Some short-term impacts, such as changes in microsite conditions, increased light penetration, less ground-based moisture retention, variable competition in more open stands near edges of protection areas, and reduced dispersal potential in more widely spaced stands may occur to the five sites receiving a 50-foot, no–cut buffer. It is likely that the six *P. pacifica* occurrences that do not receive any protection buffer could experience direct uprooting of individuals resulting in death in cases where ground-based equipment or skyline systems directly disturb soil where these populations are located. However, occurrences that do not receive any protection buffer are located in units that are prescribed for moderate thinning, which will increase the potential for protection of microclimatological conditions necessary for these species compared to units receiving a heavy thinning prescription. All occurrences receiving a 50-foot, no-cut buffer would be monitored at one, two and five years after the project is complete to test whether the lichens are adequately protected by the smaller buffers. No impacts are expected to the six occurrences that are fully buffered.

Shared synthesis of monitoring results from this project will help provide perspectives on whether forest management and ecosystem goals are being met with respect to this sensitive lichen, help identify problems to avoid in subsequent projects, and help gain consensus on what data gaps exist and what changes to the monitoring and potential new research programs are needed. Although some short-term impacts are possible for 11 of the *P. pacifica* occurrences

due to partial reduction of microclimates associated with habitat, in the long term, it is expected that variable thinning prescriptions would continue to reforest the area and return the microclimatological habitats necessary for *P. pacifica* occupation in the forest. Additionally, due to the fact that 17 occurrences were identified within the surveyed project units, it is likely that there are additional occurrences of *P. pacifica* outside of the project units nearby that may provide a propagule source in the future. The closest known occurrence of *P. pacifica*, according to the Forest database, is located approximately 10 miles south of the project area on the Umpqua National Forest near the intersection of Junella and Herman creeks (Northwest Forest Plan - IMIS 2008: http://intra.or.blm.gov/geobob/).

Thinning-generated fuels would be mitigated by yarding tops and machine piling at landings on about 2,450 acres. About 120 acres would be machine piled and burned within approximately 40 feet of open roads and landings in or adjacent to thinning areas. This represents and approximately 23 percent increase in the amount of acres included in higher intensity pile burning and additional machinery disturbance than Alternative 3. No occurrences of *P. pacifica* or *U. longissima* are within 100 feet of an identified landing site and no impacts from pile burning at landings is expected to have any impacts on these two species. Additionally, no impacts are expected to fungi due to the fact that existing landing sites are likely unsuitable habitat for these species.

Miles of road maintenance are lower in this alternative compared to Alternative 3 (Table 4). Miles of road closures are higher compared to Alternative 3. However, approximately equal amounts of areas in each alternative would experience the same amount of short-term impacts to acres potentially containing fungi (road grading, construction of physical barriers, water bars, recontouring, subsoiling, and culvert removal associated with road closures). Impacts from these types of activities are likely confined within 20 to 30 feet of the road corridor. There is one occurrence of *P. pacifica* (AH09) that is located approximately 25 feet north of FR 1802. Road grading is the only proposed activity near this occurrence. Because road grading has likely been occurring on this road in the past and is considered to have minimal impacts beyond the actual road corridor, no impacts to this *P. pacifica* occurrence would occur from road maintenance activities. Long-term benefits to acres potentially containing fungi are expected due to more miles of closed roads in this alternative.

Effects Specific to Alternative 3

This alternative is similar to Alternative 2 in relation to acres potentially impacted through thinning. Thinning-generated fuels would be mitigated by yarding tops and machine piling at landings on about 2,115 acres, potentially creating 335 acres less acreage subject to potential mycelium disturbance from fine fuels mitigation. About 40 acres would be machine piled and burned within 40 feet of open roads and landings in or adjacent to thinning areas. Buffers for the sensitive lichens would be as described in Alternative 2, and similar impacts are anticipated.

More miles of roads are proposed for maintenance, and fewer miles of classified road closures are proposed in this alternative. Short-term impacts to acres potentially containing fungi from ground-disturbing activities related to road maintenance and classified road closure activities would be similar between the two alternatives. This alternative has less potential to create new long-term fungi habitat than Alternative 2 because no classified road closures are proposed. There are no differences between the no action alternative and Alternative 3 regarding classified road closures.

Table 27. Determinations for sensitive and rare and uncommon botanical species

Species	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Agoseris elata	NI	NI	NI
Arabis hastatula	NI	NI	NI
Asplenium septentrionale	NI	NI	NI
Botrychium minganense	NI	NI	NI
Botrychium montanum	NI	NI	NI
Bridgeoporus nobillisimus	NI	NI	NI
Calamagrostis breweri	NI	NI	NI
Carex scirpoidea var.stenochlaena	NI	NI	NI
Castilleja rupicola	NI	NI	NI
Chaenotheca subroscida	NI	NI	NI
Cimicifuga elata	NI	NI	NI
Coptis trifolia	NI	NI	NI
Corydalis aqua-gelidae	NI	NI	NI
Dermatocarpon luridum	NI	NI	NI
Eucephalis vialis	NI	NI	NI
Hypogymnia duplicate	NI	NI	NI
Iliamna latibracteata	NI	NI	NI
Leptogium burnetiae var. hirsutum	NI	NI	NI
Leptogium cyanescens	NI	NI	NI
Lobaria linita	NI	NI	NI
Lupinus sulphureus var. kincaidii	NI	NI	NI
Montia howellii	NI	NI	NI
Nephroma occultum	NI	NI	NI
Pannaria rubiginosa	NI	NI	NI
Pellaea andromedaefolia	NI	NI	NI
Peltigera neckeri	NI	NI	NI
Peltigera pacifica	NI	MIIH	MIIH
Pilophorus nigricaulis	NI	NI	NI
Polystichum californicum	NI	NI	NI
Potentilla villosa	NI	NI	NI
Pseudocyphellaria rainierensis	NI	NI	NI
Ramalina pollinaria	NI	NI	NI
Rhizomnium nudum	NI	NI	NI
Romanzoffia thompsonii	NI	NI	NI
Schistostega pennata	NI	NI	NI
Scouleria marginata	NI	NI	NI
Sisyrinchium sarmentosum	NI	NI	NI
Tetraphis geniculata	NI	NI	NI
Thorluna disimilis	NI	NI	NI
Usnea longissima	NI	NI	NI
Utricularia minor	NI	NI	NI
Wolffia borealis	NI	NI	NI
Wolffia columbiana	NI	NI	NI
Mycorrhizal Fungi	NI	MIIH	MIIH
Fungi Saprophytic on Litter	NI	MIIH	MIIH
Fungi Saprophytic on Wood	NI	MIIH	MIIH
Parasitic Fungi	NI	MIIH	MIIH

NI = No impact; MIIH=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

Cumulative Effects

The area analyzed for cumulative effects to botanical threatened, endangered, sensitive, and rare and uncommon species is described in the methodology section on page 110. This larger analysis area increases the potential to predict the likelihood of such species existing in project area stream drainages and possibly define the local relative degree of rarity of species. The project area (Winberry subwatershed) represents approximately 11 percent of this analysis area.

The Fall Creek Watershed Analysis (USDA Forest Service 1995) and Fall Creek LSR Assessment (USDA Forest Service and USDI Bureau of Land Management 1996) contain background information related to the watershed in addition to known sensitive, and rare and uncommon species sites. Since then, new sites have been identified through other surveys including those associated with the Traverse Creek Thin project, the Hehe project, the Clark fire, rare and uncommon species regional random grid surveys, and various stream, trail, and campground projects. Some of these survey efforts have resulted in identification of new sensitive, and rare and uncommon species sites in the watershed for vascular and non-vascular species.

The Fall Creek watershed area is designated as Late-Successional Reserve (LSR) under the Northwest Forest Plan and approximately 38 percent of native stands are in old-growth forest conditions. These stands serve as refugia for many rare and uncommon and sensitive species that would be able to recolonize the younger stands as they mature and become more complex in structure and diversity. The watershed has abundant lichen and bryophyte populations, especially evident in the lower elevation mixed-hardwood/conifer stands. These late-successional reserve lands would ensure quality habitat is maintained for preservation and protection of sensitive, and rare and uncommon species and their associated habitats.

Historical records since the 1950s indicate nearly half of the cumulative effects analysis area has been previously harvested using various harvesting methods and stands were typically burned after harvesting in the past (Traverse Creek Silviculture Report, Schantz 2008). Previous native-old growth forests likely contained multiple populations of rare and uncommon and sensitive botanical species prior to the creation of younger managed stands. Fungal diversity declines with clearcutting and fire (Byrd et al. 2000, Bruns et al. 2002). With respect to fungi, it is probable that there has been some recovery of mycorrhizal diversity in stands over 20 years of age following clearcut activity, which has the most severe effects on mycorrhizal diversity because it removes the host species they depend upon.

At present, the Hehe Project is underway within the same watershed. The purpose of this project is similar to the Traverse Creek Thin project in that it proposes up to 4,000 acres of thinning in young 30- to 60-year-old plantations to maintain vigor and growth using stand treatments to promote healthy forests and to increase resistance to insects, diseases, and damage. Associated activities also include road decommissioning, fuel treatment and other watershed restoration projects. It is expected that treatments from these activities associated with the Hehe Project would be beneficial to the long-term preservation of sensitive, and rare and uncommon botanical species habitats.

More recent data available summarizing acres impacted by activities in the Winberry Creek watershed can be found in Chapter 3 of this EA. Over the past 10-20 years, approximately 10.6 percent of the Winberry Creek watershed (including acres outside of National Forest) have been regeneration harvested, 7.6 percent have been precommercially thinned, 1.7 percent commercially thinned and less than 1 percent receiving a fuels treatment. Although these

estimates apply only to the Winberry portion of the Fall Creek Watershed, it is expected that similar activities have occurred in the Fall Creek watershed area in the past 10 to 20 years.

Given the large proportion of federal land ownership in the Fall Creek watershed (approximately 82 percent) it is assumed that protection of sensitive, and rare and uncommon species and their habitat on public lands will protect these species as a whole. No foreseeable future projects are proposed in the area.

The desired condition of the forest related to this project is the development of large trees, multi-storied canopies, horizontal patchiness, and species diversification. Additionally, commercial thinning of young, managed stands in riparian reserves would increase the average diameter of the stand, and/or accelerate the development of the shade-tolerant understory. Accelerating the diameter growth of riparian stands will assist in creating late-successional conditions sooner and provide for a faster development of large woody material sources for instream and terrestrial habitat. Although, there may be some short-term direct and indirect effects to *P. pacifica* and possible unknown effects to fungi species, it is expected that this project, in combination with past and future projects, would not have any cumulative effects.

Conclusions and Rationale for Determination Statements

In summary, because no surveys were completed to determine effects on fungi, all action alternatives were given a determination of "may impact individuals or habitat (MIIH), but will not likely contribute to a trend towards federal listing or loss of viability for the population or species". For the lichen species *P. pacifica*, project activities may have a impact on population of the species or its habitat due to a smaller than optimum protection buffer, therefore a determination of "may impact individuals or habitat (MIIH), but will not likely contribute to a trend towards federal listing or loss of viability for the population or species".

For the rest of the species, all alternatives were given a "no impact" (NI) determination because either no treatments would occur, no populations were found, or the documented populations and associated habitat are sufficiently buffered through mitigation measures or located away from the impacts of project activities.

Invasive Weeds

Methodology

The forestwide invasive weed GIS layer was used to identify areas within and near the project area that could contribute to the establishment of invasive weeds from proposed project activities. These data layers are deemed as being current and up to date due to the fact that a recent invasive weeds EA was completed in 2007 (USDA Forest Service 2007).

Additional surveys of existing weed populations within the proposed project area were conducted during the summer of 2007 in conjunction with botanical sensitive plant surveys. Proposed project units as well as all roads within the project area were surveyed. The results of the survey in combination with forestwide corporate data form the basis for analyzing effects.

Presence of an invasive weed and the ability of the identified species to readily spread and impact resources constitute this analysis. Direct and indirect effects analysis include the project area and haul roads into and out of the project area that can serve as additional avenues of infestation and spread. Cumulative effects spatial and temporal boundaries include all identified locations within the project areas and haul roads into and out of the project area, the

past 15 years of activity and the future 5 years of foreseeable actions. These temporal bounds likely represent much of the time period in which many of the species were identified to pose an impact and although the new Invasive Weeds EA has an estimated life span of the next 10 years, it is only realistic to estimate potential projects based on available funding for the upcoming 5 years.

Existing Condition

Invasive weeds identified within the Traverse Creek Thin project area are: Slender false brome (*Brachypodium sylvaticum*), Himalayan blackberry (*Rubus discolor*), Evergreen blackberry (*Rubus laciniatus*), Reed canarygrass (*Phalaris arundinacea*), Foxglove (*Digitalis purpurea*), White clover (*Melilotus alba*), Canada and bull thistle (*Cirsium* spp), Scot's broom (*Cytisus scoparius*), Wild carrot (*Daucus carota*), St John's wort (*Hypericum perforatum*), Herb Robert (*Geranium robertianum*), Everlasting pea vine (*Lathyrus polyphyllus*), Oxeye daisy (*Leucanthemum vulgare*), and Tansy ragwort (*Senecio jacobaea*). Sites are located within the interior of project units, along roadsides of project units, along roadsides within the project area, and along roadsides that may serve as haul roads into and out of the project area. Presently, there are 157 individual invasive weed sites identified within the project area with slender false brome representing the largest proportion (approximately 48 percent) followed by evergreen blackberry (approximately 22 percent), and foxglove (approximately 15 percent). In general, these sites are very small individual occurrences of 0.1 acre or less, and for the most part are located along roadsides (82 percent). In addition to the single invasive weed occurrences described above, previous data available indicate there are approximately an additional 41.7 miles of roads within the project area, of which 5.7 miles are identified within project unit boundaries. Invasive weed species in these road corridors consist of many of the same species listed above with multiple species occurring within an infested road segment. For a complete review of all invasive weed sites and a list of weed species identified as 'new invaders' on the forest, see Appendix B.

The following species are most commonly associated with forest openings such as road corridors, clearcuts and younger plantations.

False Brome (*Brachypodium sylvaticum)*: False brome is a perennial grass species of Eurasian origin and considered a new invader to the Willamette National Forest (USDA Forest Service 2007). This species is a highly invasive perennial grass that has the capability to dominate the forest floor to the exclusion of native species. The species moves along road corridors by being deposited from the undercarriages of vehicles or by foot traffic. Once established, false brome is spread by road maintenance equipment. From the road shoulder, the species can move into forested stands, especially those with openings such as thinned timber sale units. Due to the large number of sites present within the project area, combined with the aggressive nature of this plant, this species should be considered a primary threat to native plant diversity.

Scot's broom (*Cytisus scoparius):* Scot's broom is a well-established, widespread woody shrub in the legume family up to 10 feet tall. A long-lived, early seral colonizer, it favors roadsides and early seral plantations, does not grow well in forested areas, and becomes shaded out when forest canopy closes. It is scattered along several roads in the project area.

Everlasting pea vine *(Lathyrus latifolius):* This species is a rhizomatous deep-rooted legume that climbs or forms a thick viney mat. It grows best in full sunlight, and is common along roadsides and in disturbed areas. In the past, it has been used as a wildlife cover and erosion control plant. Occurrences within the project area are located along roadsides.

Purple Foxglove *(Digitalis purpurea):* Purple foxglove is a biennial forb that is already well established across the Pacific Northwest as well as the Willamette National Forest (USDA Forest Service 2007). Foxglove readily colonizes disturbed areas, forming dense patches that displace natural vegetation and is shade tolerant. Due to the fact that this species reproduces only by seed, and newly emerging seedlings are not able to penetrate turf or litter, this species commonly establishes in disturbed areas only. As an invader of disturbed sites, it is likely to hinder natural successional processes. This species is generally found along roadsides and in open areas within the project area.

White Sweet Clover *(Melilotus alba):* White sweet clover is a biennial legume. Sweet clovers (white and yellow) are considered new invaders to the Willamette National Forest (USDA Forest Service 2007). White sweet clover degrades natural grassland communities by overtopping and shading native species. White sweet clover readily invades open areas. Natural or human-caused fires produce excellent growing conditions by scarifying seeds and stimulating germination. The clearings in forested land are easily colonized by sweet clover. This species is generally found along roadsides and in open areas within the project area.

Oxeye Daisy *(Leucanthemum vulgare):* Oxeye daisy is an established rhizomatous perennial in the sunflower family found nearly throughout the forest in open meadows, and disturbed areas such as roads and old landings.

Tansy ragwort *(Senecio jacobaea):* Tansy ragwort is a widespread tap-rooted biennial or short-lived perennial. The plant contains several alkaloids toxic to livestock that causes irreversible liver damage. This plant is documented to occur within the project areas along roadsides.

Canada and bull thistle (*Cirsium* spp): These two species are abundant in open areas throughout the forest. Bull thistle is an early successional stouter biennial or perennial that reproduces by seed and establishes well in open disturbed sites, but declines as other vegetation dominates. These two species are predominately located within the project area along roadsides and previously disturbed areas.

St John's wort (*Hypericum perforatum*): St. John's wort or Klamath weed is another well-established, non-native perennial herb that reproduces by seed or short runners. This plant is difficult to remove from meadows and it easily breaks at the soil surface when pulled. It is probably one of the biggest threats to the higher elevation native meadow/prairie systems on the forest. Occurrences within the project area are located along roadsides.

Himalayan and Evergreen Blackberry (*Rubus discolor* and *R. laciniatus*): Blackberry plants are ubiquitous throughout western Oregon and are found in significant numbers in streamside corridors at lower elevations. These species are considered new invaders on the Willamette National Forest (USDA Forest Service 2007). These species are found primarily along the roads in or adjacent to project units.

Species with habitats other than those associated with roadsides and open areas, limited occurrences or with lower priority for treatment are listed below:

Reed Canarygrass (*Phalaris arundinacea*): Reed canarygrass is a cool season perennial grass that is an aggressive and undesirable species in many lowland areas and considered a new invader on the Willamette National Forest (USDA Forest Service 2007). Reed canary grass and the sod layer formed by its roots, displace other desirable plant species by forming dense,

monotypic stands that outcompete most native species, thus altering wetland ecosystems. Although there is only one occurrence of this species within the project area in a wet area along the roadside, this species should be treated as soon as possible to reduce the potential establishment and spread.

Wild carrot (*Daucus carota*): Wild carrot is a monocarpic perennial herb and a member of the parsley family that invades open waste ground, competing for resources with native grasses and forbs. The Willamette NF does not typically track this species and considers this species to be of lower concern.

Herb Robert (*Geranium robertianum*): This annual or biennial outcompetes native plant species especially in the understory of forests. Sticky seeds adhering to wildlife, people, and pets can be ejected 15 to 20 feet from the parent plant.

Environmental Consequences

Direct and Indirect Effects

Alternative 1

The no action alternative would not mitigate for any invasive plant populations that persist in the project area. It is unknown whether invasive species are increasing, decreasing or stable because there is no available data on rates of weed spread on federal or non-federal lands in the watershed. Long-term data collection and monitoring of weed populations has not been done on road systems in the project area. Because no logging or road maintenance machinery would be dispatched to the site, there should be no risk of additional introduction from contaminated off-road equipment. Alternative 1 does not provide any soils or fuels treatment scenarios that could promote short-term weed flushes; no ground would be opened to provide a seed bed for invasive species; therefore, this alternative has the least direct risk of spreading weeds. No forest would be thinned; many shade-intolerant weed species cannot survive the deeper darker conditions that would result from foregoing thinning in these stands; thus 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. Weed populations already present in perpetually open areas in the project area would remain growing unchecked unless treated.

Alternatives 2 and 3

Thinning activities, spur road construction, and classified road maintenance increase risk of invasive plant seed dispersal and establishment by creating conditions that allow invasive plants to establish in disturbed sites and eventually out-compete native plants. Soil disturbance and transport of seed are direct effects of timber harvest on weed introduction and persistence. In the action alternatives, the areas that would be permanently opened up to light and disturbance (e.g., 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 seed in.

Road maintenance and upgrading associated with the action alternatives that are of particular concern are road systems that are infested with false brome, as vehicular traffic may facilitate movement of weed seed up and down road systems when seed is caught in the mud on vehicle undercarriages. Additionally, new temporary spur construction and road upgrading activities could potentially bring in weed seed from contaminated gravel. Three stream culverts along Road 1928 are proposed for replacement as well as numerous ditch relief culverts scattered throughout the project area roads. Activities associated with these actions in combination with known invasive weeds nearby may provide opportunities for weed establishment and

concomitant dispersal of propagules via water. All these activities increase the risk of invasive weed introduction through potential contamination from off-road equipment that is not cleaned, as well as by opening up a seedbed.

It is well documented that roads are common areas of weed infestation as well as vectors for spread. Presently, approximately 90 percent of the new invader weed sites are associated with roads and/or haul routes in the project area. Of these identified sites, at least 32 of the sites are located near or at proposed landing areas; most contain blackberries and scattered, linear false brome sites. Because weeds most often travel along road systems, risk of weed infestation decreases in areas where roads and landings are closed, rehabilitated, and seeded with desirable species.

The alternative with the greatest number of disturbed acres and miles of road for hauling logs would create the most habitats for invasive weed introduction. Harvest creates habitat by opening of the canopy and by yarding logs using ground-based equipment that disturbs soils. Potential invasive habitat would be accentuated by gap openings because greater canopy opening would occur and likely more ground disturbance to soil would occur also. Limiting mechanical disturbance helps to limit spread of the existing weed seedbank into the stands. Weed invasion into adjacent thinned stands could lead to competition, affecting tree and shrub seedling establishment and growth, which in turn could affect sensitive botanical species.

Alternative 2 would reduce the miles of roads in the project area by about 3 percent. Many of the proposed closures are short spur roads (9 total) in lengths of 0.09 and 0.33 miles (see Roads report). Many of the new invader weed sites are presently located near some of these proposed road closures. False brome is a new invader on this forest and has the potential to cause extensive weed problems. Once established, it is easily spread by road maintenance equipment and can quickly move into forested stands, especially those with openings such as thinned timber sale units. Therefore, this project proposes to take aggressive measures to mitigate the spread of this weed (see the “Invasive Weeds” section of the Mitigations listed in Chapter 2 of this EA). Table 28 presents a list of new invader species located near (approximately 250 feet) activities associated with classified road closures, temporary roads and closures of existing temporary roads.

In the short term, Alternative 2 may have a higher potential for these new invaders to spread because more ground disturbance may be associated with classified road closures. Mitigation measures associated with false brome and other weeds in the area requiring effective treatment prior to closing as well as post harvest treatment/monitoring are expected to decrease permanent weed establishment in these areas as native vegetation regrows. All action alternatives would eventually decrease the risk of permanent weed establishment when native vegetation regrows in the long term.

Alternative 2 includes 120 acres of grapple piling adjacent to roads, representing approximately 66 percent more acres disturbed that would create invasive weed habitat by soil disturbance compared to Alternative 3 (40 acres). Each action alternative proposes the same number of new landings (helicopter and skyline), therefore, establishment potential for weeds is similar.

Table 28. Weeds associated with road activities by alternative. Weeds are located within approximately 250 feet of proposed road activity.

Classified Road Closures					
Unit #	**Species*/Acres**	**Road #**	**Alt 2**	**Alt 3**	**Mitigation buffer in Unit for False Brome**
1408	BRSY/ 0.1	1802-160	Y	N	Y
1446	BRSY/ 0.1	1816-224	Y	N	Y
1592	BRSY/ 0.1	1802-158	Y	N	Y
3434 (2 loc)	BRSY / 0.1 BRSY / 0.1	1802-164	Y	N	Y
n/a	BRSY / 0.1	1816	Y	N	N
n/a	BRSY (9 locs)/ all 0.1	1802-164	Y	N	N
1446	DIPU / 0.1	1816-224			
n/a	RULA (2 locs)/2-3 plants	1802-164	Y	N	N
n/a	RUDI / 2-3 plants	1802-164	Y	N	N
n/a	DIPA / 0.1	1824	Y	N	N
n/a	RULA / 2-3 plants	1824	Y	N	N
Existing Temp Road Closure					
1387	BRSY / 0.1	1802-160	Y	Y	Y
New Temporary Road					
1395	BRSY /0.1	1802-164	Y	Y	Y
1581	BRSY / 0.1	1802-855	Y	Y	Y
1296	BRSY / 0.1	1802-162	Y	Y	Y
1378	DIPU / 0.1	1821	Y	Y	N

* BRSY = False Brome, DIPA = Purple Foxglove, RULA/RUDI = Blackberry

Cumulative Effects

Cumulative effects for weeds are analyzed on a watershed scale (spatial) since the entire Fall Creek basin contains habitat and weed species similar to those in the project area, and the past 20 years (temporal), because it likely represent most recent available data pertaining to potential spread. Modes and patterns of dispersal and rate of spread of species are similar to those found elsewhere in the watershed. Cumulative effects were considered for all species found in the project area collectively with the other sites in the watershed.

The Fall Creek watershed contains approximately 76,704 acres. Past activities within the watershed that have increased habitat for invasive weed establishment include clearcutting, shelterwood harvesting and activities associated with these activities (grapple piling, burning, etc). Additionally, several roadside projects in the recent past such as hazard tree removal, fire salvage, and restoration of fire-damaged recreation areas have also provided additional habitat for weed establishment. The Fall Creek watershed has not been completely inventoried for weeds except for project-associated activities. A more recent project in the Fall Creek watershed (Hehe LSR Thinning Project, USDA Forest Service 2007a; also see Appendix B) indicates many of the same species as identified within this project area. However, the inventory is not a complete inventory of the entire subwatershed and only reports those in proximity to proposed units and along haul routes. For a complete description of all invasive plants, see the Hehe Botanical report associated with the environmental assessment (ibid.). It is

assumed that much of the uninventoried portions of the watershed contain similar amounts of areas impacted by invasive plants as those reported in this project and the Hehe Thinning Project (ibid.).

Activities such as recreational use of the forest as well as maintenance activities along the main travel route within in watershed (FS Road 18) will continue to provide opportunities for weeds to establish and spread regardless of proposed activities within the area. Treatments of known and future sites are expected to continue under the direction of the Willamette National Forest Integrated Weed Management Environmental Assessment (USDA Forest Service 2007). There are 483 miles (approximately 1,463 acres) of open roads in the watershed. Refer to the Environmental Assessment for the Hehe Project (USDA Forest Service 2007a) for the history of the road system development in the Fall Creek watershed. No new roads are proposed for Forest Service use in the future.

Alternative 1 (No Action) - This alternative would not construct any new roads or reconstruct old roads and would not create any additional areas for establishment of weeds; therefore, this alternative would contribute no additional cumulative effects. Incremental increases in weed infestation, whether by human or natural disturbances, likely will continue, but cannot be accurately predicted because of numerous variables associated with vectoring of weeds.

Alternative 2 - Activities that would perpetuate or increase habitat for weeds include approximately 44.7 miles of road representing about 153.3 acres of open weed corridor, or 0.2 percent of the watershed. Arguably, road maintenance could be considered included within normal maintenance activities, however, is included in these calculations to consider situations where road grading activities may provide new establishment areas for weeds. Stand treatment activities associated with this alternative would create approximately 2,572 acres of additional habitat (approximately 3 percent of the watershed).

Alternative 3 – Activities that perpetuate or increase habitat for weeds with this alternative include approximately 55.3 miles if road representing about 190 acres of open weed corridor, or 0.25 percent of the watershed. Stand treatment activities associated with this alternative would be the same as Alternative 2.

Conclusions and Rationale

All alternatives, including no action, would result in new and continued disturbances that promote introduction and colonization of new weed species and expansion of existing species in the project area. The risk of future weed infestation can be reduced by implementation of best management practices (BMPs) outlined in the Willamette National Forest Integrated Weed Management program (USDA Forest Service 2007), as well as mitigation measures incorporated into project design. Mitigating measures to be applied would cumulatively lower the risk of increasing invasive plan populations within the area.

Special Habitats

Methodology

The Fall Creek Watershed Analysis (USDA Forest Service 1995), Fall Creek LSR Assessment (USDA Forest Service and USDI Bureau of Land Management 1996) and the forestwide corporate GIS database were assessed for known sites of special habitats within the Winberry Creek subwatershed and surrounding areas. Botanical surveys for sensitive, and rare and

uncommon species were conducted June 13 through July 21, 2007. These surveys also identified special habitats within the proposed project units.

Presence of special habitats formed the basis for evaluating effects. The scale for analysis for direct and indirect effects includes the project area. The temporal and spatial scales for cumulative effects include the Fall Creek watershed, the past 20 years and future 5 years. The project area (Winberry subwatershed) represents approximately 11 percent of this analysis area. This spatial analysis area was chosen because it likely contains additional sensitive habitats similar to those suspected to be in the Traverse Creek Thin project. Special habitats elsewhere in the watershed help further define the local relative degree and protection of the special habitats. The temporal scale was chosen because it likely represents the best available data for past management activities and potential future projects to take place in the area.

Existing Condition

Many of the stands in Traverse Creek Thin project area contain naturally occurring features that are designated as special habitats. Hardwood inclusions, scattered small wetlands and drier non-forested openings are the most common special habitats in the area (Table 29). These areas were identified during project botanical surveys in the summer of 2007, provide habitat for various plant communities, and contribute species diversity to the area.

Additionally, there are other special habitats identified from previous surveys (corporate GIS data layers) known to occur adjacent to project units (Table 30). Locations of these existing special habitats were taken into consideration upon project design to ensure no impacts to these special areas. Other designated special habitats outside of proposed project units and scattered throughout the Winberry/Fall Creek watershed include: dry rock gardens, dry meadows, mesic meadows, rock outcrops, Sitka alder, vine maple, rock quarries, wet meadows, small openings or gaps in the forest canopy and small ephemeral waterbodies too small to be mapped on other water layers (USDA Forest Service and USDI Bureau of Land Management 1996, and Willamette NF corporate GIS data). Appendix D of the Botany Report (Laufmann 2008) displays the locations of special habitats in the Traverse Creek Thin project area.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Objectives of this thinning project are to reduce stocking and improve or maintain stand growth and health in second growth stands. It is expected that all naturally occurring special habitats would remain unimpacted by any activities to ensure diversity of the forest. Some of the identified habitats within units are already partially protected by riparian buffers implemented within the project design. Additionally, there are only two identified special habitats (rock piles) identified within units that are proposed for heavy thinning. Additional mitigation measures described in Chapter 2 and applied to each special habitat located within each unit would ensure little to no direct or indirect effects to special habitats within the Traverse Creek Thin Project.

Table 29. Special habitats locations within the Traverse Creek Thin Project units

Project Unit #	Special Habitat Type	Approximate Size (acre)	Protected within riparian buffers
1242	dry meadow	1	
1242	dry meadow	2	partially
1310	dry meadow	2	
1310	dry meadow	2	
1310	swamp	1	buffered
1370	swamp	0.5	buffered
1370	vine maple	1	partially
1387	swamp	1.5	buffered
1421	rock quarry	0.25	
1430	*alnus rubra* forest	10	
1430	riparian area	1	buffered
1446	swamp	1.5	buffered
1446	swamp	1.5	buffered
1490	rocky outcrop	4	
1490	swamp	3	buffered
1523	wetland/pond	0.3	partially
1575	*alnus rubra* forest	10	
1575	*alnus rubra* forest	15	partially
1575	*alnus rubra* forest	15	
1575	*alnus rubra* forest	15	
1575	*alnus rubra* forest	15	partially
1575	boulder field	3	partially
1575	boulder field	3	partially
1592	dry meadow	3	
1592	dry meadow	3	partially
1596	wetland	0.5	buffered
1619	vinemaple	4	
1639	rockpile	2	partially
1732	swamp	3	buffered

Table 30. Special habitat locations adjacent to project units

Project Unit #	Special Habitat Type	Approximate Size (acre)
4972	Dry Meadow	1.3
1394	Mesic meadow	0.6
1592	Rock Outcrop	3.7
1421	Rock Outcrop	1.7
4972	Sitka Alder	1.4
1443	Sitka Alder	10.7
1370	Vine Maple	1.0
1242	Small Opening/Gap	1.5
1310	Small Opening/Gap	8.1
1523	Wetland/Pond	2.8

Recreation

Visitors choose specific settings for their recreation activities in order to enjoy desired experiences. These settings vary throughout the entire forest and therefore the project area. The recreation opportunity spectrum (ROS) is a classification system that describes different outdoor recreation settings across the Forest using seven standard classes that range from primitive, undeveloped settings to urban, highly developed settings. Attributes typically considered in describing the settings are size, scenic quality, type and degree of access, remoteness, level of development, social encounters, and the amount of on-site management. By describing existing recreation opportunities in each class, ROS helps match visitors with their preferred recreation setting. ROS can also be used to plan how areas should be managed for recreation in the future (USDA Forest Service 1986). Changes in ROS classes affect the recreation opportunities offered. The two ROS classes that can be found in the project boundary are Roaded Natural and Roaded Modified. All of the approximate 2,900 acres being proposed for the thinning is within the Roaded Modified class.

Methodology

Issues

No key or substantive issues were raised from public comments. However, the Forest Service identified the following issue for analysis:

- Commercial thinning and fuel treatments may decrease the current ROS class acreages found in the project area. Specifically vegetation's, line, form, color, and texture could be affected, thereby potentially affecting recreation desirability. Changing a ROS class setting could cause a ROS class to move away from its current designation, thereby moving the area away from the desired future condition of the area.

  Issue measurement indicator - Impacts to the ROS class are measured by determining whether the implementation of an alternative moves the land towards (meets), away from (does not meet), or keeps (No Change) the area in its current ROS class designation. "Meets" and "no change" pushes the landscape or keeps it going towards the desired future condition, while "not meets" takes the landscape away from meeting the desired future condition.

Other issues identified are being addressed through mitigation measures to minimize or eliminate adverse effects. These include:

- Construction of a new culvert on Winberry road may temporarily reduce public access to Winberry campground.
- Noise and traffic increase from logging trucks used during Alternatives 2 and 3 may affect the ROS class. Mitigation measures for noise and traffic per ROS class would be developed if determined to be necessary during the implementation process.

Because there are no permanent new roads being proposed for the project area, the remoteness character of the various classes would not be changed and roads will not be an issue with the remote character of the project area.

When analyzing effects to recreation resources, "short term" is considered the time passing during the implementation of the project and "long term" is considered 1 year after the project has been implemented. The project boundary is the boundary used for the cumulative effects portion of this project. The scope of the cumulative effects analysis will include recreation

resources found in both the project boundary and the land found 300 feet outward from the project boundary.

Existing Condition

Recreation activities in the project area include driving for pleasure, ATV and motorcycle riding, hunting, camping, hiking, fishing, wildlife viewing, gathering forest products (berries, rocks, firewood, mushrooms) and dispersed camping. There are no congressionally designated wild and scenic rivers or wilderness areas within the project boundary. There are no designated inventoried roadless areas, special interest areas, national scenic trails, or national recreation trails within the project boundary.

Throughout the project area, there are ponds, rivers, and streams that offer a rich recreation experience to visitors. Trail 3476 (Eugene-to-Crest Trail), TR 3482 (Joe's Peak Trail), TR 3471 (Winberry Divide Trail), TR 3481 (Saddleblanket Mountain Trail) and trail numbered 3559P are either within the foreground of the project boundary's perimeter or in the project area itself. Forest Service Road 1802 (Winberry Road), which leads to Winberry campground may be of interest since work being proposed on this road may disrupt recreation activities. Any work on this road may temporarily affect the usage by campers to this campground. There is one lookout--Saddleblanket Lookout, which is not in service and is not maintained for public use. Timber Butte Cabin rental is not a lookout. It is a replica lookout, not elevated, built as a recreation rental and is reserved during the summer months. The lookout and cabin are located along the project area boundary. The lookout and cabin have thick vegetation in and around them. These are all the recreation resources that are found in the project boundary's outer perimeter immediate foreground or within the project boundary.

Currently, each recreation resource meets the Roaded Modified and Roaded Natural characteristics and attributes specified in the LRMP.

Desired Condition

The ROS classes for the entire project boundary are Roaded Natural and Roaded Modified. Besides the Forest goals and objectives, and the ROS classes assigned by the forest plan found under the Forest Management Goals of this report, the LRMP describes the desired future condition of recreation for 10 and 50 years, respectively (LRMP, p. IV-8).

The ROS class visual criteria for ROS class sense of place for 10 years should be an open forest where individual trees are discernable, which allows the (slope) topography to be viewed exposing vegetation, (ground cover and shrubs), rock outcroppings, and any water features found throughout the project boundary. In 50 years, more of the same should occur however, the vegetation overstory canopy would be more closed.

Environmental Consequences

The resources discussed in all alternatives are as follows: Winberry campground, 3559P, TR 3476 (Eugene-to-Crest Trail), TR 3482 (Joe's Peak Trail), Saddleblank Lookout, TR 3481 (Saddleblanket Mountain Trail), TimberButte Cabin, and TR 3471 (Winberry Divide Trail). These resources were obtained from the forest visitor's map published by the Willamette National Forest. In addition, the recreation resources were field verified.

As previously mentioned, commercial thinning and fuel treatments could change the current recreation opportunity spectrum class acreages found in the project area. Specifically the line,

form, color, and texture attributes of the natural setting's physical attribute of the Roaded Modified ROS class could be affected, thereby affecting the ROS class's designation. Because the number of treated acres for both Alternatives 2 and 3 are identical, and the recreation resources are not being treated in either alternative, the effects for Alternatives 2 and 3 to the recreation resources are anticipated to be the same and are combined in this analysis.

The only activities that are considered in the cumulative effects sections of this report will be the events from the 1990s into the reasonable foreseeable future including each alternative action.

Alternative 1

Direct and Indirect Effects

Under alternative 1, there would be no impacts to the recreation resources or the designated ROS class. This is excluding catastrophic events that may occur. The area would continue to meet its current ROS class designation while trending towards the desired future condition. There would also be no effects to the specific recreation resources mentioned previously.

Cumulative Effects

Doing nothing as proposed in Alternative 1 would not change the current ROS class or the current recreation resources' ROS designation. Therefore, there would be no cumulative effects occurring to the recreation resources in the ROS class for the area.

Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 could impact the physical attributes of the Roaded Modified ROS class. There would not be direct effects to any of the recreation resources because no treatments would occur directly in the recreation areas. However, there could be indirect effects of increased noise and traffic, causing short-term effects to the "evidence of humans" attribute. Mitigation measures would be implemented to decrease this effect.

The physical setting of the Roaded Natural and the Roaded Modified ROS classes would be negatively affected in the short term because of the change in vegetation of the area during project implementation. But upon implementation of the mitigation measures, both ROS classes would be met in the long term. There are no long-term direct effects to the recreation resources because no treatments are being proposed in recreation resources such as Winberry Campground under either action alternative.

Cumulative Effects

No cumulative effects would occur to the specific resources beyond the short term because no treatments are proposed by either Alternative 2 or 3 in the immediate vicinity of recreation resources such as Winberry Campground. However, there are approximately 2,600 acres that would be treated in the Roaded Modified ROS class of the project area out of the total 14,000 acres within the project boundary. Out of all the past harvest activities, approximately 3,600 acres of precommercial thinning and 7,000 acres of commercial thinning have modified the physical attribute natural setting (Vegetation). The proposed project would occur entirely in areas that have been previously modified by harvesting. In the short term, roads used during project implementation could be degraded by log hauling. These roads would be maintained according to the mitigations detailed in Chapter 2 of this EA.

Cultural Resources

Existing Condition

The area encompassed by the project boundary was assessed for known cultural resources. The affected environment includes those areas identified for treatment activities in Alternatives 2 and 3. These areas are within the identified project boundary as shown in Chapter 2 of the EA. The areas proposed for ground-disturbing activities have been surveyed and evaluated for the presence of inventoried cultural resources. There are 45 heritage resources within one mile of the proposed project area. Of these sites, 38 heritage resources are within the project boundary. Of these 38 sites, 14 are within or immediately adjacent to treatment units; of these 14 heritage resources, 6 heritage resources are within proposed treatment units.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 would have no direct impacts to heritage resources. Indirect events could occur through catastrophic events, such as severe wildfire, wildfire suppression activities, or natural erosional events.

Alternatives 2 and 3 would not have direct effects to any of the heritage resources because proposed mitigation measures would ensure no treatments would occur within or adjacent to the heritage resources (see Mitigation Measures Common to all Alternatives section in Chapter 2).

Cumulative Effects

There would be no cumulative effects occurring to the heritage resources for the area under any of the alternatives because known heritage resources would be avoided or fully protected by the proposed mitigation measures.

Economics

Economic efficiency is the determination of the cost of planning and implementing forest management treatments and the benefits or revenues those treatments generate. Forest Service Manuals (2430-2432) and Handbook (2409.18 Chapters 10-30) require financial and economic efficiency information be available to the decision maker prior to substantial investment of capital and resources in timber sales. The proposed action of thinning treatments achieves forest management objectives; therefore, the sale of timber is necessary to achieving those objectives. Revenue produced from this timber is considered an offset to the cost of accomplishing the project.

Existing Condition

The high cost of planning and implementing a timber sale project may affect the overall economic efficiency of the project. The economic efficiency of this project can be thought of in two ways:

- The economic viability of the tool used to achieve the forest management objectives – for example a timber sale
- The economic efficiency of the project as a whole

The economic viability of the timber sale is primarily dependent on the type and cost of the yarding systems used, the cost of road management work, the cost of fuels reduction treatments, the cost of log haul, and the cost of mitigating measures to reduce effects. In addition, the local price paid for wood products produced from sale of the timber is also a crucial factor.

The economic efficiency of the project as a whole is primarily dependent on the timber sale economic viability as well as the cost associated with planning the project, the cost of designating and preparing the timber sale on the ground, and the cost of administrating the timber sale. Other costs might also include the potential costs for funding other resource improvement projects within the sale area. The designs and decisions made on these aspects of thinning projects influences the net revenues returned by the project.

Timber revenues are returned to the U.S. Treasury and a proportion of the revenues re-distributed back to local county governments. The thinning project also generates benefits to the economy by providing timber products, direct and indirect employment from the planning and implementation of the project, and the employment from processing, production, and manufacturing of the raw wood material.

Direction for the financial efficiency analysis can be found in the Forest Service Manual 2430-2432 (Amendments 2400-95-1 through 3) and Forest Service Handbook 2409.18, Chapters 10-30 (Amendments 2409.18-95-1 through 6). The financial efficiency analysis provides information relevant to the future financial position of the program if the project is implemented. The analysis compares estimated Forest Service direct expenditures with estimated financial revenues. Financial efficiency analysis measures two things – revenue/cost ratio and financial present net value. In addition, the timber sale economic viability can be measured by the difference between the value of the timber at the estimated bid rate and the value at the established base rate or minimum rate.

A financial efficiency analysis was completed for the project and can be found in the Analysis File. This analysis includes revenues generated from timber sale receipts, and costs of the planning, sale preparation, administration, roads, fuel treatments, and other mitigating measures. The analysis did not include an estimate of non-market amenities values due to the unpredictable nature of these values. Non-market values are required “only when excess demand exists for non-market goods (Forest Service Handbook 2409.18 32.24) or the project has detrimental effects on non-market output. For a comprehensive discussion of the social and economic considerations at the forest level, refer to the Willamette LRMP FEIS, Chapter III, pages 213-235 and Chapter IV, pages 119-130.

Environmental Consequences

Direct and Indirect Effects

Timber Sale Economic Viability

Alternative 1 (no action) produces no timber volume and therefore was not analyzed in terms of timber sale viability.

Alternatives 2 and 3 - The economic viability of the potential timber sales associated with the alternatives is summarized below (Table 31). These potential timber sales were analyzed as a whole for a given alternative. For example, all potential thinning units, harvest volumes, harvest acres, logging systems, and costs were lumped together for a given alternative. In some

cases individual treatment units or groups of treatment units may not be economically viable when considered alone or grouped by logging system (for example units grouped by the helicopter logging system).

A timber sale is considered economically viable when the revenue produced from the sale of the timber exceeds the value of the same timber at some minimum or base rate established by the Government. The difference between the value of the timber at the estimated bid rate and the value at the base rate can be used as measure of timber sale economic viability. The economic return to the Government for the sale of timber includes the cost to harvest, haul logs, manage roads, treat fuels, and conduct other mitigating measures required in the timber sale contract. A viable timber sale will likely result in the timber management treatments proposed by a given alternative being implemented since the timber sale will be the vehicle by which the projects are undertaken. Table 31 summarizes the timber sale economic viability of the potential timber sales resulting from the alternatives.

Table 31. Timber sale economic viability

Alternative	Harvest volume (MBF)	Estimated bid rate ($/MBF)	Total at bid rate ($)	Base rate ($/MBF)	Total at base rate ($)	Difference bid-base ($)
Alt 1	0	n/a	n/a	n/a	n/a	n/a
Alt 2	40,000	70.60	2,824,000	5.00	200,000	2,624,000
Alt 3	45,000	76.14	3,426,300	5.00	225,000	3,201,300

The table shows that Alternatives 2 and 3 both appear to be viable based on the positive difference between the timber values at the estimated bid rate and the values at the base or minimum rate (last column in the Table 31). Alternatives 2 and 3 differ by approximately $602,000 based primarily on the lesser cost of fuels treatments incorporated into Alternative 3, and the additional volume produce through more gaps.

Economic Efficiency

Alternative 1 (no action) would have a negative present net value because no benefits are produced to offset the cost of planning the project.

Alternatives 2 and 3 - The economic efficiency of the alternatives as a whole is summarized below. This analysis includes not only the timber sale economics (Table 31), but also the cost associated with planning the project, the cost of designating and preparing the timber sale on the ground, and the cost of administrating the timber sale (the discounted costs). Table 32 summarizes overall economic efficiency resulting from the alternatives.

Table 32. Economic efficiency

Alternative	Real disc rate	Discounted costs	Discounted revenues	Net present value	Benefit cost ratio
Alt 1	4.00%	365,200	0	-365,200	0.00
Alt 2	4.00%	1,496,857	2,610,947	1,114,090	1.74
Alt 3	4.00%	1,638,063	3,167,807	1,529,744	1.93

Alternatives 2 and 3 are very similar in both their net present values and revenue/cost ratios. The differences correspond to the acres of fuels treatments in each alternative funded by the respective timber sales and reflected in the discounted revenues (timber sale receipts).

Cumulative Effects

The cumulative effects of an alternative on the socioeconomic environment are quite difficult to estimate (LRMP FEIS, p. IV-127). In terms of cumulative effects, District or Forest timber volumes for auction may have little influence on any one mill. For example, an owner can purchase from Bureau of Land Management and private woodlot owners to get additional supply. They can also purchase logs from the Umpqua or Siuslaw National Forests. Or, at the owner's choice, they can increase or reduce the size of the mill operation, sell the operation to another company, or simply close the mill. All of these have occurred in the last decade and few, if any, of the changes to companies or communities can be tied directly to the sale of the Willamette National Forest timber.

Alternative 1 (no action) would not produce any timber volume and does not provide timber volume to the District's or Forest probable sale quantity. The action alternatives 2 and 3 would produce approximately 40,000 to 45,000 MBF respectively. This timber volume represents about 59 percent of the Middle Fork District's timber probable sale quantity for fiscal years 2008 to 2009 and 29 percent of the Forest's timber probable sale quantity for the next two years. The timber volume produced from these alternatives would have no cumulative effects to the economy of Lane, Linn, and Douglas counties given the timber landbase in these three counties.

Summary of Effects

All action alternatives would have a positive economic return in terms of the project as a whole. The no action alternative would have a negative economic return due to the money spent on the planning effort without a return from the thinning of revenue-producing timber. In addition, the potential timber sales resulting from the action alternatives appear to be economically viable when analyzed as a whole.

Consultation and Coordination

This chapter provides a list of the interdisciplinary team that coordinated and designed the project and prepared the environmental assessment, agencies and tribes consulted, and individuals and organizations that were contacted or commented during the development of the environmental assessment.

Forest Service Interdisciplinary Team

Team Members	Specialty
Chris Tootell	Team Leader
Carol Thornton	Soil Specialist/Hydrologist
Janet Moser	Wildlife Biologist
Tiffany Vanosdall	Fisheries Biologist
Cameron Bonnett	Recreation Specialist
Julie Laufmann	Botanist
Bob Nykamp	Archeologist
Rob Schantz	Silviculturist/Fuels Specialist/Logging Systems
Larry Tennis (retired)	Transportation Systems Engineer
Cass Klee	GIS Specialist
Steve Rheinberger	Economics/Logging Systems/Logging Feasibility
Judy York	Writer/Editor
Gary Marsh	Forest Contact

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:

Federal, State, and Local Agencies

U.S. Fish and Wildlife Service
National Marine Fisheries Service
Oregon Dept. of Fish and Wildlife

Tribes

Confederated Tribes of the Warm Springs
The Klamath Tribe
Confederated Tribes of the Siletz
Confederated Tribes of the Grand Ronde

Other Individuals and Organizations Consulted

American Forest Resource Council
Cascadia Wildlands Project
City of Lowell
Lane County Audubon Society
Many Rivers Group of Sierra Club
Middle Fork Willamette Watershed Council
Native Plant Society
Obsidians
Oregon Wild
Seneca Sawmill Co.
Swanson Superior
Oregon Hunter's Association
Rocky Mountain Elk Foundation
Pam Hewitt
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References

Agee, James K. 1998. The Landscape Ecology of Western Forest Fire Regimes. Northwest Science, Vol. 72 Special Issue 1998.

Altman, B. 1999. Conservation strategy for landbirds in coniferous forests of western Oregon and Washington. Version 1.0. Prepared for: Oregon-Washington Partners in Flight. March 1999.

Altman, B. 2000. Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington. American Bird Conservancy and Oregon-Washington Partners in Flight [Available online at http://community.gorge.net/natres/pif/con_plans/north_rocky/north_rocky_page1.html

Amaranthus, M.P. and D.A. Perry. 1994. The functioning of ectomycorrhizal fungi in the field: linkages in space and time. Plant and Soil 159: 133-140.

Amaranthus, M.P., D. Page-Dumroese, A. Harvey, E. Cazares, and L.F. Bednar. 1996. Soil Compaction and Organic Matter Affect Conifer Seedling Nonmycorrhizal and Ectomycorrhizal Root Tip Abundance and Diversity. Research paper, PNW-RP-494. Portland, OR. USDA, Forest Service, Pacific Northwest Research Station.

Anderson, Hal E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service, General Tech. Report INT-122, April, 1982.

Anderson, P.G. 1996. Sediment generation from forestry operations and associated effects on aquatic ecosystems. Proceedings of the Forest-Fish Conference: Land Management Practices

Anthony, R.G. and F.B. Isaacs. 1989. Characteristics of bald eagle nest sites in Oregon. J. Wildl. Manage. 53:148-159.

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland, and J.I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Trans. of the 47th N. Amer. Wildl. and Nat. Res. Conf., Washington, DC.

Anthony, R.G., M.A. O'Connell, M.M. Pollock, and J.G. Hallett. 2003. Associations of mammals with riparian ecosystems in Pacific Northwest forests. pp. 510-563 *in:* C.J. Zabel and R.G. Anthony, eds. Mammal community dynamics: management and conservation in the coniferous forests of Western North America. Cambridge University Press.

Bailey, J.D., and J.C. Tappeiner. 1998. Effects of thinning on structural development in 40-100 year old Douglas-fir stands in western Oregon. For. Ecol. Manage. 108:99-113.

Baydack, R.K., H. Campa III and J.B. Haufler. 1999. Practical Approaches to the Conservation of Biological Diversity. Island Press. Washington DC.

Blaustein, A.R., J.J. Beatty, D.H. Olson, and R.M. Storm. 1995. The biology of amphibians and reptiles in old-growth forests in the Pacific Northwest. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, General Technical Report PNW-GTR-337, March 1995.

Bradbury, S.M., R.M. Danielson, and S. Visser. 1998. Ectomycorrhizas of regenerating stands of lodgepole pine (*Pinus contorta*). Canadian Journal of Botany 76: 218-227.

Bruner, Howard J. 1997. Habitat use and productivity of harlequin ducks in the central Cascade range of Oregon. Master's Thesis. Oregon State University, Corvallis, OR. 44 pp.

Bruns, T.D., A.M. Kretzer, T.R. Horton, E. A-D. Stendell, M.I. Bidartondo, T.M. Szaro. 2002. Current Investigations of Fungal Ectomycorrhizal Communities in the Sierra National Forest. USDA Forest Service General Technical Report. PSW-GTR-183, pp 83-89. . http://www.fs.fed.us/psw/publications/gtrs.shtml accessed 03/08.

Byrd, K.B., V.T. Parker, D. R. Vogler, and K. W. Cullings. 2000. The influence of clear-cutting on ectomycorrhizal fungus diversity in a lodgepole pine (*Pinus contorta*) stand, Yellowstone National Park, Wyoming, and Gallatin National Forest, Montana. Canadian Journal of Botany 78: 149-156.

Carey, A.B., D.R. Thysell, and A. Brodie. 1999. The Forest Ecosystem Study: background, rationale, implementation, baseline conditions, and silvicultural assessment**.** USDA For. Serv. Gen. Tech. Rep. PNW-GTR-457. 129 p.

Cary, A.B. 2004. Appendix 5: relationship of prey and forest management. *in* Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland OR. September 2004.

Chapman, D. W. 1988. Critical Review of Variables Used to Define Effects of Fines in Redds of Large Salmonids. Transactions of the American Fisheries Society 1988;117:1–21.

Chappell, C.B., R.C. Crawford, C. Barrett, J. Kagan, D.H. Johnson, M. O'Mealy, G.A. Green, H.L. Ferguson, W.D. Edge, E.L. Greda, and T.A. O'Neil. 2001. Wildlife habitats: descriptions, status, trends, and system dynamics. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington.* Oregon State University Press, Corvallis, OR, USA. 736 pp

Cook, J.G. 2002. Nutrition and Food. Chapter 5, pp. 259-350. *in*: Toweill, D.E. and J.W. Thomas, editors. North American Elk: Ecology and Management. Smithsonian Institution Press. 2002.

Corkran, C.C. and C.R. Thoms. 2006. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing, Redmond, Washington. 175 pp.

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland OR. September 2004.

Cross, S.P. 1985. Responses of small mammals to forest riparian perturbations. Pages 269-275 *in* Riparian Ecosystems and Their Disturbances: Reconciling Conflict Uses. USDA F.S. GenTech Rept. RM-120:269-275.

Csuti, B., A.J. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.M.P. Huso. 1997. Atlas of Oregon Wildlife (Distribution, Habitat, and Natural History), Oregon State University Press, Corvallis, Oregon.

Curtis, Robert O. 1982. A Simple Index of Density for Douglas-fir. Forest Sci., Vol. 28 No. 1 1982. pp. 92-94

DeBell, D.S., R.O. Curtis, C.A. Harrington, and J.C. Tappeiner. 1997. Shaping stand development through silvicultural practices. pp. 141-149 *in:* Creating a Forestry for the 21st Century: The Science of Ecosystem Management. K.A. Kohm and J.F. Franklin editors. Island Press.

Dimling J. and C. McCain. 1992. Willamette National Forest Special Habitat Management Guide. USDA Forest Service. Willamette National Forest. Eugene OR.

Donnelly, Dennis M. and Ralph R. Johnson. 1997. Westside Cascades Variant of the Forest Vegetation Simulator. WO-Forest Management Service Center, USDA Forest Service, Fort Collins, Colorado.

Duncan, N. 2004. Conservation Assessment for *Pristiloma arcticum crateris*, Crater Lake Tightcoil – originally issued as management recommendations, October 1999, Darryl Gowan and Thomas E. Burke, Authors. reconfigured September 2004 by Nancy Duncan.

Durall, D.M., M.D. Jones, E.F. Wright, P. Kroeger and K.D. Coates. 1999. Species richness of ectomycorrhizal fungi in cut blocks of different sizes in the Interior Cedar-Hemlock forests of northwestern British Columbia: sporocarps and ectomycorrhizae. Canadian Journal of Forestry 29: 1322-1332.

Franklin, J.F., D.R., Berg, D.A. Thornburgh, and J.C. Tappeiner. 1997. Alternative silvicultural approaches to timber harvesting: variable retention harvest systems. pp. 111-140 *in:* Creating a Forestry for the 21st Century: The Science of Ecosystem Management. K.A. Kohm and J.F. Franklin editors. Island Press.

Franklin, J.F. 2001. Keynote comments at Workshop on Managing Young Stands to Meet LSR and Riparian Objectives, Portland, Oregon, August 29, 2001

Franklin, J.F., T.A. Spiesb, R. Van Pelta, A.B. Careyc, D.A. Thornburghd, D.R. Berge, D.B. Lindenmayerf, M.E. Harmong, W.S. Keetona, D.C. Shawh, K. Biblea and J. Chen. 2001. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. Forest Ecology and Management 5624 (2001) 1-25

Garman, S.L. 2000. Response of ground-dwelling vertebrates to thinning young stands: the young stand thinning and diversity study. Submitted To: J.H. Mayo and J.H. Cissel, Cascade Center for Ecosystem Management, Blue River Ranger District, Willamette National Forest. August 2000.

Gilbert, F.F. and R. Allwine. 1991. Spring bird communities in the Oregon Cascade Range. pp. 319-325 *in*: Ruggiero, Leonard F.; Aubry, Keith B.; Carey, Andrew B.; Huff, Mark H., tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, General Technical Report PNW-GTR-285, May 1991.

Graham, Russel T., et al. 1999. The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-463, August, 1999.

Hagar, J.C., W.C. McComb, and W.H. Emmingham. 1996. Bird communities in commercially thinned and unthinned Douglas-fir stands of western Oregon. Wildlife Society Bulletin 24 (2): 353-366.

Hallett, J.G., T. Lopez, M.A. O'Connell, M.A. Borysewicz. 2001. Decay dynamics and avian use of artificially created snags. Northwest Science 75:378-386.

Hayes, J.P, S.S. Chan, W.H. Emmingham, J.C. Tappeiner, L.D. Kellogg, and J.D. Bailey. 1997. Wildlife response to thinning young forests in the Pacific Northwest. Journal of Forestry, Vol. 95, No. 8, August 1997.

Hayes, J.P. 2003. Habit ecology and conservation of bats in western coniferous forests. In: Mammal Community Dynamics Management and Conservation in the Coniferous Forests of Western North America.

Humes, Marcia L., J.P. Hayes, M.W. Collopy. 1999. Bat activity in thinned, unthinned, and old-growth forests in western Oregon. Journal of Wildlife Management 63(2):553-561.

Hunter, Matthew G. 2001. Management in Young Forests. Communique No. 3, Cascade Center for Ecosystem Management, Dept. of Forest Science, Oregon State University, USDA Forest Service Pacific Northwest Research Station, Willamette National Forest, July 2001, 28 p.

Johnson, A. 2004. Fall Creek SIA Fire Recovery Project, Peak Stream-flow and Water Quality. Middle Fork Ranger District, Westfir, Oregon.

Kranabetter, J.M. and T. Wylie. 1998. Ectomycorrhizal community structure across forest openings on naturally regenerated western hemlock seedlings. Canadian Journal of Botany 78: 189-196.

Leonard, W.P., H.A. Brown, L.L.C. Brown, K.R. McAllister, and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society. Seattle Washington, 168 pp.

Lewellen, C. and K. Ellingson. 2007. Hehe Late Successional Reserve Thin Project - Integrated Aquatics Team Specialist Report. Willamette National Forest, Middle Fork Ranger District.

Lewis, J.C. 1998. Creating snags and wildlife trees in commercial forest landscapes. Western Journal of Applied Forestry, Vol. 13, no. 3 pp. 97-101.

Long, James M., J.B. McCarter, and S.B Jack. 1988. A modified density management diagram for coastal Douglas-fir. Western Journal of Applied Forestry 3: 88-89.

Lyon, L.J. and A.G. Christensen. 2002. Ch. 13, Elk and Land Management In: North American Elk: ecology and management. Compiled and edited by D.E. Toweill and J.W. Thomas.

Macdonald, D.D. and C.P. Newcombe. 1991. Effects of suspended sediments on ecosystems. North American Journal of Fisheries Management 1991; 11:72-82.

Marshall, D.B., M.G. Hunter, and A.L. Contreras, Eds. 2003. Birds of Oregon: A General Reference. Oregon State University Press, Corvallis, OR. 768pp.

Mellen, Kim, Bruce G. Marcot, Janet L. Ohmann, Karen Waddell, Susan A. Livingston, Elizabeth A. Willhite, Bruce B. Hostetler, Catherine Ogden, and Tina Dreisbach. 2006. DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 2.0. USDA Forest Service, Pacific Northwest Region and Pacific Northwest Research Station; USDI Fish and Wildlife Service, Oregon State Office; Portland, Oregon. http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf

Moser, Eric. 2008. Field notes on Traverse Creek Thin Project. Project record.

Muir, Patricia S., R.L. Mattingly, J.C. Tappeiner II, J.D. Bailey, W.E. Elliott, J.C. Hagar, J.C. Miller, E.B. Peterson, E.E. Starkey. 2002. Managing for biodiversity in young Douglas-fir forests of western Oregon. Biological Science Report, USGS/BRD/BSR-2002-0006, October 2002.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application].Version4.7.NatureServe,Arlington,Virginia.Available http://www.natureserve.org/explorer. Copyright © 2008 NatureServe, 1101 Wilson Boulevard, 15th Floor, Arlington Virginia 22209, U.S.A. All Rights Reserved.

Nussbaum, R.A., E.D. Brodie II, and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Idaho.

Oliver, Chadwick D. and Bruce C. Larson. 1990. Forest Stand Dynamics. McGraw-Hill, Inc. San Francisco, CA. 467 p.

Olson, D.H., J.C. Hagar, A.B. Carey, J.H. Cissel, and F.J. Swanson. 2001. Wildlife of westside and high montane forests. pp. 187-212. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington.* Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.

O'Neil, Thomas A., David H. Johnson, Charley Barrett, Maria Trevithick, Kelly A. Bettinger, Chris Kiilsgaard, Madeleine Vander Heyden, Eva L. Greda, Derek Stinson, Bruce G. Marcot, Patrick J. Doran, Susan Tank, and Laurie Wunder. *Matrixes for Wildlife-Habitat Relationship in Oregon and Washington*. Northwest Habitat Institute. 2001. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 736 pp.

ORNHIC (Oregon Natural Heritage Information Center). Oregon State University, Institute for Natural Resources, Portland, Oregon.

Penttila, R. and H. Kotiranta. 1997. Short-term effects of prescribed burning on wood-rotting fungi. Silva Fennica 30(4): 399-419. http://www.metla.fi/silvafennica/sf304.htm accessed 4/08

Pilz, D., L. Norvell, E. Danell, and R. Molina. 2003. Ecology and management of commercially harvested chanterelle mushrooms. Gen. Tech. Rep PNW-GTR-576 Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. http://www.fs.fed.us/pnw/publications/gtrs2003.shtml accessed 03/08

Poage, N.J. 2001. Structure and development of old-growth Douglas-fir in central western Oregon**.** PhD Thesis, Oregon State University, Corvallis.

Poage, N.J., and J.C. Tappeiner. 2002. Long-term patterns of diameter and basal area growth of old-growth Douglas-fir trees in western Oregon. Can. J. For. Res. 32(7):1232-1243.

Rashin, E.B., C.J Clishe, A.T., Loch, and J.M. Bell. 2006. Effectiveness of timber harvest practices for controlling sediment related water quality impacts. Journal of American Water Resources Association.

Reineke, L.H. 1933. Perfecting a stand-density index for even-aged forests. J. Agric. Res. 46, pp. 627-638

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY. 84pp.

Rose, C.L., B.G. Marcot, T.K. Mellen, J.L. Ohmann, K.L. Waddell, D.L. Lindley, B. Schreiber. 2001. Decaying wood in Pacific Northwest forests: concepts and tools for habitat management. pp. 580-623. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 736 pp.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski (technical editors). 1994. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service General Technical Report RM-254. September 1994.

Smith, J.E., R. Molina, M. M.P. Huso, D. L. Luoma, D. McKay, M.A. Castellano, T. Lebel, and Y. Valachovic 2002. Species richness, abundance, and composition of hypogeous and epigeous ectomycorrhizal fungal sporocarps in young, rotation-age, and old-growth stands in Douglas-fir (*Pseudotsuga menziesii*) in the Cascade Range of Oregon, USA. Canadian Journal of Botany 80: 186-204.

Sandberg, David V.; Ottmar, Roger D.; Peterson, Janice L.; Core, John. 2002. Wildland fire in ecosystems: effects of fire on air. Gen. Tech. Rep. RMRS-GTR-42-vol. 5. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 79 pp.

Stendell, E.R., T.R. Horton, T.D. Bruns. 1999. Early effects of prescribed fire on the structure of the ectomycorrhizal fungus community in a Sierra Nevada ponderosa pine forest. Mycological Research 103: 1353-1359. http://cat.inist.fr/?aModele=afficheN&cpsidt=1988072 accessed 4/2008

Tappeiner, J.C., D. Huffman, D. Marshall, T.A. Spies, and J.D. Bailey. 1997. Density, ages, and growth rates in old-growth and young-growth forests in coastal Oregon**.** Can. J. For. Res. 27:638-648.

Thomas, J.W., D.A. Leckenby, M. Henjum, R.J. Pederson, and L.D. Bryant. 1988. Habitat-Effectiveness Index for Elk on Blue Mountain Winter Range. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-218.

Thomas, J.W., E.D. Forsman, J.B. Lint, [and others]. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Portland, OR: USDA Forest Service; USDI Bureau of Land Management, Fish and Wildlife Service, and National Park Service. 427pp.

Thorton, C., T. Vanosdall, and D. Walters. 2008. Traverse Creek Thin Project: Integrated Aquatics Team Specialist Report for Soils, Hydrology, and Fisheries. Traverse Creek project file.

Torren, D., and P. Nilles. 2003. Management recommendations for *Bryoria tortuosa* (Merr) a Mendocino National Forest watchlist species found at the homesite project and sunset campground, Lake Pillsbury, Mendocino National Forest. Unpublished report. http://www.fs.fed.us/r5/mendocino/projects/hfi/docs/bryoria-tortuosa.pdf accessed 5/08

USDA Forest Service. 1987. Forester's Field Handbook – Pacific Northwest Region, revised 1987. R6-SPF-TP-283-87.

USDA Forest Service. 1988. General Water Quality Best Management Practices, Pacific Northwest Region, Portland, OR86 pp.

USDA Forest Service. 1990. Willamette National Forest, Land and Resource Management Plan. Eugene, OR. 1990.

USDA Forest Service. 1990a. Final Environmental Impact Statement for the Land and Resource Management Plan –Willamette National Forest. Eugene, OR. 1990.

USDA Forest Service. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. Portland, OR. 1994.

USDA Forest Service. 1995. Fall Creek Watershed Analysis. Willamette National Forest, Lowell Ranger District, Lowell, Oregon.

USDA Forest Service 1998. Stream Inventory Handbook, Level I and II. Pacific Northwest Region, 1998, version 1.8. Portland, Oregon.

USDA Forest Service. 2003. Willamette National Forest Road Analysis Report. Willamette National Forest, Eugene, OR.

USDA Forest Service. February 2004. Middle Fork Road Analysis Report. Middle Fork Ranger District, Willamette National Forest. Westfir, OR

USDA Forest Service. 2005a. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Final Environmental Impact Statement. USDA Forest Service, Pacific Northwest Region, Portland, OR

USDA Forest Service. 2005b. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Record of Decision. USDA Forest Service, Pacific Northwest Region, Portland, OR

USDA Forest Service 2007. Integrated Weed Management Environmental Assessment, Willamette National Forest. Eugene, OR. 190pp.

USDA Forest Service. 2007a. Hehe LSR Thinning Project, Environmental Assessment. Middle Fork Ranger District, Willamette National Forest. http://www.fs.fed.us/r6/willamette/manage/nepa/current/hehe/hehe-ea-4.pdf accessed 3/2007

USDA Forest Service. 2008. Willamette Basin Water Quality Restoration Plan, Willamette and Umpqua National Forests, Submitted April 30, 2008 and currently under review by Oregon Department of Environmental Quality, 142 pp.

USDA Forest Service and USDI Bureau of Land Management, 1994a. Final Supplemental Environmental Impact Statement on the Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. Portland, OR. 1994.

USDA Forest Service and USDI Bureau of Land Management. 1994b. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, USDA Forest Service and USDI Bureau of Land Management.

USDA Forest Service and USDI Bureau of Land Management. 1996. Winberry and Lower Fall Creek Watershed Analysis. USDA Forest Service Middle Fork Ranger District, USDI BLM Eugene District, Lowell, Oregon.

USDA Forest Service and USDI Bureau of Land Management. 2003. Natural History and Management Considerations for Northwest Forest Plan Survey and Manage Lichens. http://www.blm.gov/or/plans/surveyandmanage/MR/Lichens/20041022/Lichens-346949.pdf

USDA Forest Service and USDI Bureau of Land Management. 2005. Sufficiency Analysis for Stream Temperature. Portland, OR.

USDA Forest Service. 2007a. Hehe LSR Thinning Project, Environmental Assessment. Middle Fork Ranger District, Willamette National Forest. http://www.fs.fed.us/r6/willamette/manage/nepa/current/hehe/hehe-ea-4.pdf accessed 3/2007

USDA Forest Service 2007b. Integrated Weed Management Environmental Assessment, Willamette National Forest. Eugene, OR. 190pp.

USDA Forest Service. 2008. Willamette National Forest Biological Assessment (BA) For Four Vegetation Management Projects. Willamette National Forest, Eugene, OR.

USDI Fish and Wildlife Service. 1986. Recovery Plan for the Pacific Bald Eagle. U.S. Department of Interior, Fish and Wildlife Service, Portland, OR.

USDI Fish and Wildlife Service. 2008. Final recovery plan for the northern spotted owl, *Strix occidentalis caurina*. Portland, Oregon. May 13, 2008. xii + 142 pp.

Verts, B.J. and Leslie N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley and Los Angeles, California.

Visser, S. 1995. Ectomycorrhizal fungal succession in jack pine stands following wildfire. New Phytologist 129: 389-401. http://www.jstor.org/view/0028646x/di008792/00p0234i/0 accessed 03/08 http://www.jstor.org/sici?sici=0028-646X(199503)129%3A3%3C389%3AEFSIJP%3E2.0.CO%3B2-1 accessed 4_08.

Wilson, Duncan S. and Klaus J. Puettmann. 2007. Density management and biodiversity in young Douglas-fir forests: Challenges of managing across scales. Forest Ecology and Management 246 (2007) 123-134

Wisdom, M., L.R. Bright, C.G. Carey, W.W. Hines, R.J. Pedersen, D.A. Smithey, J.W. Thomas, and G.W. Witmer. 1986. A model to evaluate elk habitat in western Oregon. USDA Forest Service, Pacific Northwest Region Report R6-F&WL-216-1986. March 1986.

Yaeger, J. Scott. 2005. Habitat at fisher resting sites in the Klamath Province of Northern California. A thesis presented to the faculty of Humboldt State University in partial fulfillment of the requirements for the degree Master of Science in natural resources: Wildlife. May 2005.

Appendix A - Project Compliance with Federal and State Laws

All project alternatives were designed using the appropriate direction and guidelines found in the Willamette National Forest Land and Resource Management Plan (LRMP), the Northwest Forest Plan, the Aquatic Conservation Strategy, and Best Management Practices. These alternatives are also consistent with other guidance or direction such as the Endangered Species Act of 1973, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1996, the Clean Water Act, Wild and Scenic Rivers Act, and Executive Orders 12962, 11988, and 11990. Specific guidance components applicable to this project and a discussion of compliance with this direction are presented below, by each category.

A-1: The Willamette National Forest Land and Resource Management Plan (LRMP) (1990), as amended[1]

These commercial thinning treatments are directed by the standards and guidelines in the Forest Plan according to commercial thinning (MA-14a-13) and the land allocations (General Forest, Special wildlife Habitat, Matrix, and Riparian Reserves). All thinning treatments would take place on land classified as suitable for timber production. Areas determined to be unsuitable have been avoided and dropped from the units. Thinning maintains or enhances species diversity through the development of understory vegetation, and all tree species would be retained as part of the residual stand. These stands have not reach culmination of mean annual increment, and no regeneration harvest is planned. The gaps that would be created are considered a part of the natural stand structure of older Douglas-fir, and not a regeneration method.

No regeneration harvest is proposed with this project. Gaps created are considered to be a part of the natural stand structure of older Douglas-fir, and would not be reforested. If desired in the future, reforestation (e.g. understory planting or group selections) on these sites would be feasible and have a high potential for success, as evidenced by the current high stocking levels and productivity of these stands.

The principle policy document relevant to wildlife management on the Forest is the 1990 Willamette National Forest Land and Resource Management Plan, referred to as the Forest Plan for the remainder of this section. The Forest Plan provides standards and guidelines for management of wildlife species and habitats. Standards and guidelines are presented at the Forest level (LRMP, FW-121 to FW-174) or Management Area level. Management Areas included in this project area are General Forest (MA-14a), Northern Spotted Owl Habitat Area (MA-9a), Pileated Woodpecker Habitat Area (MA-9b), Marten Habitat Area (MA-9c), Special Habitat Area (MA-9d), Riparian Areas (MA-15).

- Management objectives for deer and elk habitat apply to specific mapped “Big Game Emphasis Areas” (BGEA) within the Willamette National Forest. Effects to these species will be discussed in this section.

[1] This document was amended by the NW Forest Plan in 1994, however, the management direction within must still be applied where they are more restrictive or provide greater benefits to late-successional and old-growth forest related species than other provisions of the NW Forest Plan standards and guidelines.

Management Area 9d: Saddleblanket Mountain Special Wildlife Habitat Area: This allocation protects special or unique habitats for wildlife and botanical resources such as dry meadows, cliffs, caves, talus mineral springs, mineral licks, wet meadows, marshes, and bogs.

Of the special wildlife habitat area, 723 acres exist within the project area along the northeast perimeter and along both the North and South Fork Winberry Creek. Units 1538 (13ac), 1512 (40ac), 1456 (12.5ac), 1581 (3.5 ac) and 1575 (10ac), totaling 79 acres are proposed for moderate thinning. No special habitat features will be affected by this project. The goal of the forest plan is to protect and enhance unique wildlife habitats and botanical sites.

Specific forestwide goals, standards and guidelines were established in the LRMP (Chapter IV, 3-4, 45-95) to provide direction on project design with a goal of minimizing negative effects to soil, water, and fish.

Amendment 37 (July 1997) to the Willamette Land and Resource Management Plan (USDA, 1990) adds four Conservation Strategies as amendments to the Forest Plan. The Conservation Strategies are for: *Aster gormanii, Ophioglossum pusillum, Cimicifuga elata* and *Frasera umpquaensis*.

Determination of Project Consistency

The project is consistent with the competing vegetation direction. In the thinning units, competing and unwanted vegetation is not a concern due the age of the stands, seral stage condition of the stands, and the proposed treatment type. These stands are 35 to 60 years old and are dominant in size and height to any competing vegetation. Competing vegetation may come into the created gaps. In these areas, the potential major future competitors to coniferous seedlings are big leaf maple, vine maple, and rhododendron. All three species are currently present in portions of these units in varying concentrations. The prevention strategy was selected, after consideration of previous experience with these vegetation types. Over the long term, the canopy cover will expand back to the point where the shading will control the levels of most potential competing vegetation, except in larger gaps. Since these types of gaps are a desired stand structural element, their continued presence would not be a concern during the next rotation.

Proposed actions associated with this project comply with current Forestwide and management area (MA) standards and guidelines pertaining to general wildlife and MIS management - including those MIS species also listed as threatened, endangered, or sensitive.

All goals and standards/guidelines from the LRMP were reviewed prior to project development and integrated into the project design for all alternatives. All alternatives are consistent with this direction. The MIS fish groups identified in the LRMP will continue to persist as viable populations under all alternatives.

A-2: The Northwest Forest Plan (1994) as amended

Current standards and guidelines governing management of this area provide direction that promotes long-term maintenance of amount and distribution of suitable habitat for cavity nesters and cavity excavator species.

The Northwest Forest Plan established specific standards and guidelines for management within riparian reserves and key watersheds.

The LRMP was amended by the Northwest Forest Plan, however administratively withdrawn areas and all other LRMP standards and guidelines apply where they are more restrictive or provide greater benefits to late-successional and old-growth-forest-related species than other provisions of the Northwest Forest Plan standards and guidelines.

As a general rule, standards and guidelines for Riparian Reserves prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives.

Determination of Project Consistency

This proposal also complies with other standards and guidelines established for affected allocations in the Willamette National Forest Land and Resource Management Plan (1990) as amended by the Northwest Forest Plan Records of Decision (ROD; 1994, 2001).

All standards and guidelines for management within riparian reserves and key watersheds were reviewed prior to project development and integrated into the project design for all alternatives. All alternatives are consistent with this direction.

A-3: Aquatic Conservation Strategy (ACS) as amended in 2003

An integral part of the Northwest Forest Plan, the goal of the ACS is: to maintain and restore the ecological health of watersheds and the aquatic ecosystems within them. The four major components of the ACS (as noted below) provide the basis for protection of watershed health.

1) Riparian Reserves were established to buffer streams and other water bodies. Riparian Reserves are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Standards and guidelines prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives. Riparian Reserves include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing waterbodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats. Under the Aquatic Conservation Strategy, Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed.

2) Key Watersheds were identified across the Northwest Forest Plan area to serve as the cornerstones of aquatic species recovery.

3) Watershed Analysis: Procedures for conducting analysis that evaluates geomorphic and ecologic processes operating in specific watersheds. This analysis should enable watershed planning that achieves Aquatic Conservation Strategy objectives. Watershed Analysis provides the basis for monitoring and restoration programs and the foundation from which Riparian Reserves can be delineated. Watershed Analysis must be completed prior to management in Key Watersheds, and Riparian Reserves.

4) Watershed Restoration. A comprehensive, long-term program of watershed restoration to restore watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms.

Projects that will include management within a Riparian Reserve must:

1) Describe the existing condition, including the important physical and biological components of the fifth-level watershed(s) in which the project area lies,

2) Describe the effect of the project on the existing condition; and

3) Demonstrate that in designing and assessing the project the decision maker considered and used, as appropriate, any relevant information from applicable watershed analysis.

This work will address these items at a level of detail in proportion to the risk associated with the project.

The project is deemed consistent with the ACS objectives if it is designed to contribute to maintaining or restoring the fifth-level watershed condition over the long term, even if short-term effects may be adverse.

Determination of Project Consistency

ACS Components: All action alternatives prescribe management within the riparian reserves. This management was designed to improve the long-term function of the reserves in regard to providing high quality water and fish habitat conditions. This may involve some short-term negative effects that will be offset by long-term improvements. The project area is not in a key watershed. Watershed analysis was completed for the Winberry 6th-level watershed in 1996. General recommendations from that analysis regarding riparian management were incorporated into project design. Other watershed restoration is planned, with the addition of woody material into streams, road decommissioning, and road drainage improvements.

ACS Consistency: The existing condition of the Winberry 6th-level watershed is described in the Winberry and Lower Fall Creek watershed analysis (USDA Forest Service and USDI Bureau of Land Management 1996). Additionally, watershed disturbance levels for the Winberry 6th-level watershed are described in section 2.2.1.of the Integrated Aquatics Team Specialist Report, which can be found in the project record. More explicit detail and project effects on existing condition are disclosed for the watershed in section 2 of that document. Negative short-term effects were identified, with numerous longer term beneficial effects. Watershed analysis recommendations were incorporated into the project design for all alternatives.

This project is consistent with the ACS because it is designed to contribute to maintaining or restoring the watershed condition over the long term, with only minor short-term negative effects.

A-4: Best Management Practices (BMPs)

The Pacific Northwest Region entered into an agreement with the State of Oregon adopting "General Water Quality Best Management Practices" in November 1988. These BMPs were integrated into the LRMP as management direction. Specific information on how to correctly integrate BMPs into the NEPA process is found in Appendix H of the LRMP FEIS.

Determination of Project Consistency

Applicable BMPs are included in the Mitigations Common to all Action Alternatives section of this report. Implementation of the identified BMPs will limit the potential negative effect to water quality, and fish habitat, and therefore to the aquatic resource. All alternatives are consistent with this direction.

A-5: The Endangered Species Act (ESA) of 1973 (as amended)

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of species listed pursuant to the Act. Section 7(a)(2) states that each Federal agency shall… "insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat."

Determination of Project Consistency

This project has been designed to be consistent with the existing programmatic BA, which covers thinning timber sales on the Mt. Hood and Willamette National Forests and portions of the Eugene and Salem Bureau of Land Management Districts. Consultation with National Marine Fisheries Service regarding project consistency with the programmatic decision is ongoing. The project consistency worksheet currently being prepared for this project will show how the project was designed to meet specific project design criteria set out in the programmatic BA. One site-specific variance to the project design criteria is proposed in this project and an analysis to describe how the effects associated with the planned exception still fall within the expected range of effects as described in the programmatic biological assessment will be included in consultation.

This project has been designed to promote the conservation of ESA-listed UWR Chinook salmon. It is highly probable that all alternatives for this project will not jeopardize the continued existence of UWR Chinook salmon, or result in the destruction or adverse modification of designated critical habitat. All alternatives are therefore consistent with ESA direction.

Because no surveys were completed to determine effects on fungi, all action alternatives were given a May Impact Individuals or Habitat (MIIH), But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability for the Population or Species rating.

Usnea longissima was given a No Impact (NI) determination because the documented populations and associated habitat are sufficiently buffered through mitigation measures or located away from the impacts of project activities.

Peltigera pacifica was given a MIIH determination and will be partly or fully buffered depending on location of known populations in relation to project activities.

A-6: 1918 Migratory Bird Treaty Act (MBTA) and the Migratory Bird Executive Order 13186

Migratory Bird Treaty Act (MBTA) of 1918 established an international framework for the protection and conservation of migratory birds. This Act makes it illegal, unless permitted by regulations, to "pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird . . ."

Executive Order (E.O. 13186) entitled "Responsibilities of Federal Agencies to Protect Migratory Birds." requires the "environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluates the effects of actions and agency plans on migratory birds, with emphasis on species of concern."

Determination of Project Consistency

All alternatives are consistent with the 1918 Migratory Bird Treaty Act (MBTA) and the Migratory Bird Executive Order 13186. Alternatives were designed under current Forest Service policy for landbirds. Vegetation management cannot completely avoid unintentional take of birds, no matter what mitigations are imposed on the activities. Mitigation, such as retention of snags and down logs, retention of live trees, and avoidance of riparian areas proposed in this project will minimize take of migratory birds.

A-7: The Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1996 as amended

Section 305(b)(2) of the MSA directs that “Each Federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act.” The MSA implementing regulations (50CFR part 600), specifically §600.920(a) states that “Federal agencies must consult with NMFS regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect EFH.

Chinook salmon are the only MSA fish species on the Willamette National Forest. Essential fish habitat has been delineated in the Willamette River Basin based on the process described in MSA §303(a)(7). Federal agencies are to minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat (MSA §303(a)(7)).

Determination of Project Consistency

All streams currently or historically occupied by spring Chinook salmon in the project area have been designated as essential fish habitat by the NMFS. Designated EFH is synonymous with designated critical habitat. Minor negative effects to occupied and critical habitat are predicted to occur with all action alternatives, as described earlier in this document. These effects will be short term in nature, and are not expected to result in biologically measurable changes in EFH condition. Consultation has been initiated with NMFS(refer to discussion of ESA consistency). This project is consistent with the MSA.

A-8: Clean Water Act (PL92-500, as amended in 1977 and 1982)

The Oregon Department of Environmental Quality is the agency responsible for implementation of the Clean Water Act within the State. Oregon Administrative Rules (Chapter 340, Division 41) identifies beneficial uses, which may include: potential anadromous fish passage, salmonid rearing, salmonid spawning, resident fish and aquatic life.

The ODEQ provides temperature and turbidity concern thresholds, with limits on allowable increases.

Additionally in 2005, the State of Oregon agreed with the FS and BLM that implementation of the "Northwest Forest Plan Temperature TMDL Implementation Strategies" would meet our requirements for protection of water temperature.

Determination of Project Consistency

Winberry Creek is listed as water quality limited for temperature because it exceeds the temperature criterion of 17.0ºC for salmonids. Planned harvest will not occur within the primary shade zone and harvest will not remove more than 50 percent canopy closure in the secondary shade zone, as described in the TMDL implementation strategy. All of the alternatives for this project will have a neutral short-term effect on stream water temperature, and will potentially reduce stream water temperature in the long-term due to improved tree health, height, and canopy size with the proposed silvicultural treatment.

All alternatives will increase turbidity levels in streams within the project area, primarily due to road improvements and road decommissioning. These effects are not expected to exceed the point-source turbidity thresholds established by ODEQ. All action alternatives will result in short-term negative effects that will be offset by short-term and long term reductions in chronic sediment sources, and reduced risk of episodic large-scale sediment delivery to streams, thereby resulting in reduced turbidity levels in the future.

All alternatives are consistent with this direction.

A-9: Wild and Scenic Rivers Act

None of the streams potentially affected by this project are designated or proposed to be Wild or Scenic.

Determination of Project Consistency

This Act is not applicable to this project.

A-10: National Historic Preservation Act of 1966, as amended

This Act requires Federal agencies to consult with American Indian Tribes, and various State and local groups before nonrenewable cultural resources, such as archaeological and historic structures, are damaged or destroyed. Section 106 of this Act requires Federal agencies to review the effects project proposals may have on the cultural resources in the Analysis Area.

Determination of Project Consistency

The alternatives were either designed to avoid or exclude these areas from any management activities, have mitigated the effects by protecting the sites with down logs, and or minimized the site disturbances with yarding log suspension requirements.

A-11: Executive Order 12962, Recreational Fisheries (1995)

Federal agencies shall, to the extent permitted by law and where practicable, and in cooperation with States and Tribes, improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by:

a) developing and encouraging partnerships between governments and the private sector to advance aquatic resource conservation and enhance recreational fishing opportunities;

b) identifying recreational fishing opportunities that are limited by water quality and habitat degradation and promoting restoration to support viable, healthy, and, where feasible, self-sustaining recreational fisheries;

c) fostering sound aquatic conservation and restoration endeavors to benefit recreational fisheries;

d) providing access to and promoting awareness of opportunities for public participation and enjoyment of U.S. recreational fishery resources;

e) supporting outreach programs designed to stimulate angler participation in the conservation and restoration of aquatic systems;

f) implementing laws under their purview in a manner that will conserve, restore, and enhance aquatic systems that support recreational fisheries;

g) establishing cost-share programs, under existing authorities, that match or exceed Federal funds with nonfederal contributions;

h) evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order; and

i) assisting private landowners to conserve and enhance aquatic resources on their lands.

Determination of Project Consistency

Recreational fishing is an identified use in the analysis area, primarily on Fall Creek. This project will not result in any appreciable reduction in the fish population numbers or otherwise negatively affect the fishing opportunity. All alternatives are consistent with this Order.

A-12: Executive Order 11988, Floodplains

This Order requires government agencies to take actions that reduce the risk of loss due to floods, to minimize the impact of floods on human health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Determination of Project Consistency

All alternatives are consistent with this direction.

A-13: Executive Order 11990, Wetlands

This order requires government agencies to take actions that minimize destruction, loss or degradation of wetlands. Streamside Riparian Reserves, seeps and other wet habitats are to be assessed.

Determination of Project Consistency

All alternatives are consistent with this direction.

A-14: Laws and Regulations for Soils

In 36 C.F.R. 219.14(a), there is direction to the Forest Service to classify lands under their jurisdiction as not suited for timber production if they fall into any of four categories 1) Non-forest, 2) Irreversible soil or watershed damage (from NFMA 6(g)(3)(E)(i), 3) No assurance of reforestation within five years, and 4) Legislatively or administratively withdrawn.

Determination of Project Consistency

The direction was reviewed and areas with irreversible soil damage were identified and avoided during project design under all alternatives. All alternatives are consistent with this direction.

A-15: Regional Guidelines for Soils

The Forest Service has developed regional guidelines (Forest Service Manual R-6 Supplement No. 2500.98-1 (Title 2520 – Watershed Protection and Management)) which clarifies direction for planning and implementing activities in areas where soil quality standards are exceeded from prior activities; redefines soil displacement; and provides guidance for managing soil organic matter and moisture regimes.

Determination of Project Consistency

These regional guidelines were reviewed and it was determined that all project alternatives are consistent with these guidelines.

Appendix B – Past, Present and Foreseeable Activities Relevant to Cumulative Effects

For the majority of the cumulative effects analyses, the analysis area was defined by the boundary used in the Interagency Winberry and Lower Fall Creek Watershed Analysis (1996). This analysis area was used in order to remain consistent and comparable with the Watershed Analysis. The cumulative effects analysis includes the history of harvest and other stand management activities beginning in the 1940s and the effects of timber harvest and road systems on vegetation, wildlife habitat, air quality, recreation, water quality, fisheries, and hydrology of the watershed. The analysis includes future harvest projects for which the NEPA process has begun. The table below names the recent past, ongoing and future projects for which NEPA is complete.

Project Timeframe	Winberry Creek Drainage	Fall Creek Drainage
Recent Past	Grin Thin Pencil Thin Windy Thin	Clark Fire Roadside Salvage Bedrock Campground Restoration fall Creek SIA Salvage Boundary Thin Borderline Thin Fringe Thin
Ongoing	Windy Cabin Thin Cabin Thin	Edge Thin - ongoing Periphery Thin - ongoing Margin Thin - ongoing Portland Thin - ongoing Fall Thin -ongoing
Future (all part of the Hehe LSR Project)		Zog Thin - future Sunshine Thin - future Tiller Thin - future Symbol Thin - future Pernot Thin - future Hehe Thin - future

A possible fish habitat improvement project in the Winberry Creek drainage is being considered. Such a project would be done under a separate NEPA analysis and has not yet begun.

The table below presents a summary of activities that have occurred in the past and are ongoing within the Fall Creek Watershed. Note that there are no foreseeable future activities. The listing includes the small amount (18.5 percent) of private lands within the lower part of the watershed. Vegetation conditions for the private lands were estimated from aerial photography. The various resource analyses may have used a subset of these activities, depending on the size of the appropriate analysis area, for instance, either single or multiple 6th-level subwatersheds.

Table 33. Summary by decade of past, present, and future activities in Fall Creek Watershed

Decade	Acres by Activity Category					
	Regeneration Harvest	Fuels Treatment	Commercial Thinning	Precomm. Thinning	Fertilization	Pruning
1940s	5,844	2,960	0	0	0	0
1950s	5,915	5,630	0	0	0	0
1960s	9,203	8,763	0	0	0	0
1970s	6,152	5,969	26	3,298	1,801	0
1980s	6,979	6,205	254	8,626	12,338	20
1990s	1,113	904	711	2,815	2,380	1,065
2000-2004	39	39	962	1,818	191	12
2004-2010	29	29	5,902	1,790		400
Foreseeable Activities	0	0	0	0	0	0

Road Systems in the Winberry Creek Watershed

The first primitive “truck trail” roads built in the watershed began in the early 1900s for the primary purpose of administrative access for fire protection. In the 1920s few roads constructed. The emphasis was still to develop a road system for effective fire protection. In the late 1940s demand for timber products increased significantly and lower use project roads, such as roads within a timber sale area, were constructed. In the early 1960s the road design standards were improved and many of the main access roads were constructed. The vast majority of the roads in the watershed were constructed from the 1960s through the 1980s when demand for timber and recreation access to public lands dramatically increased. Road construction was minimal in the 1990s with the decline in timber targets and emphasis shifted toward decommissioning and closure of roads given limited road maintenance budgets. The Winberry Creek watershed has approximately 139 miles of road. The current system consist of about 9.38 miles of paved roads, 111 miles of aggregate surface roads, 19 miles of improved surface or pit run roads and 7 miles of native surface roads.

Appendix C - Sale Area Improvements - Funded Project Priority List

No essential projects were identified.

Mitigating Measures

1. Road Closure and Rehabilitation (roads and temporary spurs not closed with timber sale contract).
2. Invasive Weed Control and Surveys.
3. Erosion Control Seeding and Fertilization.
4. Coarse Wood Debris - Snag and Down Wood Creation and Monitoring

Resource Opportunity Projects

These projects are not considered connected actions to the proposed action nor reasonably foreseeable future actions for the cumulative effects analyses because there are no specific plans or information about these activities at this time. Separate environmental analysis would be completed for these projects prior to implementation.

The following projects would be eligible for sale area improvement funding should money be available from timber stumpage payments after implementation of an action alternative or from other sources not connected with the proposed timber sale. The projects are listed in order of descending priority;

1. In-stream structure placement of large woody debris on North Winberry Creek
2. Wildlife Forage Enhancement projects
3. Timber stand improvement projects
4. Firewood inventory and removal
5. Repair or maintenance of Timber Butte Cabin, Saddleblanket Lookout, Little Blanket Shelter
6. Trail maintenance

Appendix D – Detrimental Soils Condition Predictions by Treatment Unit

Table 34. Detrimental soil condition by unit

		Percentage Detrimental Soil Conditions by Category									
Unit	**Acres**	**Existing (Excluding Roads)**	**Classified Roads**	**Total Existing**	**Landings**	**Temporary Roads**	**Helicopter**	**Skyline**	**Ground-Based**	**Total from Proposed Activities**	**Total After Activities**
1160	**3**	**8***	**5.3**	**13**	**7.5**	**0.0**	**0.0**	**0.0**	**10.0**	**17**	**31***
1200	48	8*	2.4	**10**	3.1	0.5	0.2	0.8	4.0	9	19*
1242**	**73**	**34**	**2.1**	**36**	**1.7**	**0.0**	**0.1**	**0.0**	**9.3**	**11**	**47**
1257**	**41**	**25***	**2.5**	**28**	**3.1**	**0.8**	**1.0**	**0.0**	**0.0**	**5**	**32***
1278	34	5*	0.4	**5**	3.0	0.7	0.0	1.8	0.0	5	11*
1296	62	10*	1.7	**12**	3.2	0.6	0.0	0.9	1.7	6	16*
1310	**20**	**5***	**4.4**	**9**	**6.3**	**0.4**	**0.0**	**1.3**	**3.0**	**11**	**20***
1323**	**60**	**8**	**2.6**	**11**	**2.5**	**0.0**	**0.0**	**0.0**	**10.0**	**12**	**23**
1364**	5	7	0.0	**7**	0.0	0.0	0.0	0.0	10.0	10	17
1370	**49**	**8**	**1.8**	**10**	**6.1**	**0.3**	**0.0**	**1.4**	**2.4**	**10**	**20**
1378**	28	3	2.1	**5**	7.2	1.1	0.0	1.0	4.6	14	19
1387	**63**	**8**	**2.3**	**10**	**2.8**	**0.5**	**0.0**	**0.8**	**5.4**	**10**	**20**
1388	**35**	**7**	**3.8**	**11**	**7.2**	**1.2**	**0.0**	**0.3**	**8.4**	**17**	**28**
1394	32	5*	2.6	**8**	8.5	0.0	0.0	1.8	0.0	10	18*
1395	41	7*	1.0	**8**	1.8	1.6	0.0	1.3	3.0	8	16*
1402	33	5*	0.9	**6**	6.8	0.7	0.0	1.8	0.0	9	15*
1408	**18**	**5***	**1.2**	**6**	**4.2**	**2.8**	**0.0**	**1.0**	**5.5**	**14**	**20***
1411	22	5*	1.6	**7**	6.7	0.3	0.0	1.8	0.0	9	15*
1412	**7**	**7**	**5.1**	**12**	**0.0**	**0.0**	**0.0**	**0.0**	**10.0**	**10**	**22**
1421**	**36**	**7***	**2.5**	**10**	**7.0**	**0.0**	**0.0**	**1.2**	**3.1**	**11**	**21***
1426	34	5*	1.7	**7**	6.0	0.0	0.0	1.8	0.0	8	14*
1430	41	8*	2.1	**10**	3.1	0.0	0.0	1.8	0.0	5	15*
1432	**47**	**8**	**3.3**	**11**	**2.7**	**0.0**	**0.0**	**0.5**	**7.4**	**11**	**22**
1435	26	8	1.6	**10**	6.7	0.0	0.0	1.8	0.0	9	18
1440	41	7	0.5	**7**	3.6	0.3	0.0	1.0	4.3	9	17

		Percentage Detrimental Soil Conditions by Category									
Unit	**Acres**	**Existing (Excluding Roads)**	**Classified Roads**	**Total Existing**	**Landings**	**Temporary Roads**	**Helicopter**	**Skyline**	**Ground-Based**	**Total from Proposed Activities**	**Total After Activities**
1443	**33**	**7***	**0.5**	**7**	**3.7**	**1.5**	**0.0**	**0.7**	**6.1**	**12**	**20***
1446**	44	5	3.6	**9**	5.1	0.0	0.2	1.0	3.1	9	18
1451	40	5*	1.0	**6**	3.8	0.3	0.0	1.8	0.0	6	12*
1456	43	5	1.9	**7**	2.3	0.0	0.0	1.3	3.1	7	14
1470	19	8*	0.6	**9**	1.3	0.0	0.0	1.8	0.0	3	12*
1476	**12**	**8***	**5.5**	**14**	**10.5**	**0.0**	**0.0**	**1.8**	**0.0**	**12**	**26***
1477	45	1	2.0	**3**	1.7	0.0	0.0	0.0	10.0	12	15
1490	27	8*	2.5	**11**	3.7	0.0	0.0	1.1	3.9	9	19*
1493	39	3	1.8	**5**	5.2	0.0	0.0	1.4	2.2	9	14
1495	**19**	**8***	**0.0**	**8**	**9.4**	**2.4**	**0.0**	**0.8**	**5.6**	**18**	**26***
1511	**62**	**6***	**1.7**	**8**	**2.4**	**0.0**	**0.0**	**0.0**	**10.0**	**12**	**20***
1512	51	8*	0.5	**8**	1.5	0.0	0.0	0.3	8.5	10	19*
1514	**19**	**10***	**2.4**	**12**	**6.7**	**0.0**	**0.0**	**1.8**	**0.0**	**8**	**21***
1516	50	1	1.4	**2**	2.0	0.0	0.0	0.0	10.0	12	14
1523**	30	3	2.4	**5**	1.7	0.0	0.0	0.0	10.0	12	17
1533	26	3	2.8	**6**	2.0	0.0	0.0	0.0	10.0	12	18
1534	10	15	2.1	**17**	0.0	0.0	0.4	1.1	0.0	2	19
1537	44	8	2.5	**10**	1.1	0.0	0.4	0.3	3.8	6	16
1538**	50	3	2.8	**6**	1.5	0.0	0.0	0.0	10.0	12	17
1539**	**17**	**15**	**2.9**	**18**	**3.0**	**0.0**	**0.0**	**1.0**	**4.4**	**8**	**26**
1546	20	5	3.0	**8**	1.3	0.0	0.0	0.0	10.0	10	19
1552	53	8	1.5	**10**	1.9	0.0	0.0	1.1	4.0	7	17
1566**	68	3	1.6	**5**	3.3	0.0	0.3	1.2	0.8	6	10
1574	31	7*	1.9	**9**	4.0	0.0	0.0	0.9	5.1	10	19*
1575	34	7*	0.9	**8**	5.2	0.0	0.0	1.8	0.0	7	15*
1576	36	8*	0.5	**9**	3.5	0.0	0.0	1.8	0.0	5	14*
1577	48	9*	1.0	**10**	4.2	1.0	0.0	1.5	1.7	9	18*
1579	60	10*	2.9	**13**	3.8	0.0	0.2	1.4	0.0	5	18*
1581	13	6*	0.8	**7**	3.8	1.5	0.0	1.8	0.0	7	14*
1592	30	8	1.2	**9**	2.5	0.0	0.4	1.0	1.1	5	14

		Percentage Detrimental Soil Conditions by Category									
Unit	**Acres**	**Existing (Excluding Roads)**	**Classified Roads**	**Total Existing**	**Landings**	**Temporary Roads**	**Helicopter**	**Skyline**	**Ground-Based**	**Total from Proposed Activities**	**Total After Activities**
1594	17	8*	1.8	**10**	1.4	0.0	0.0	1.8	0.0	2	13*
1596	42	7*	0.4	**7**	2.9	0.6	0.0	1.2	2.8	7	15*
1601	34	7*	2.0	**9**	2.9	0.0	0.5	0.0	4.9	8	17*
1605	14	9*	0.4	**9**	5.4	0.5	0.0	1.8	0.0	8	17*
1611	31	3	1.5	**5**	5.6	0.0	0.0	1.2	3.6	10	15
1618	27	4	1.6	**6**	10.2	0.0	0.0	1.8	0.0	12	18
1619	37	7	2.7	**10**	1.4	0.0	0.7	0.0	2.8	5	15
1633	32	4	1.6	**6**	6.2	0.3	0.3	0.5	4.5	12	17
1638	9	4	0.8	**5**	2.7	0.0	0.0	1.8	0.0	5	9
1639	**16**	**7***	**3.7**	**11**	**9.2**	**0.0**	**0.0**	**1.8**	**0.0**	**11**	**22***
1647	**8**	**3**	**3.4**	**6**	**6.6**	**0.0**	**0.0**	**0.0**	**10.0**	**17**	**23**
1649	32	3	3.1	**6**	2.4	0.6	0.0	1.1	4.2	8	14
1658**	58	4	3.1	**7**	2.6	0.2	0.0	0.7	6.1	10	17
1679**	34	5	1.4	**6**	2.9	0.0	0.0	1.5	1.9	6	13
1701	**10**	**6**	**3.4**	**9**	**5.0**	**0.0**	**0.0**	**0.5**	**7.0**	**13**	**22**
1714	44	5*	1.5	**6**	2.9	0.0	0.2	0.6	4.8	8	15*
1732	33	6*	0.5	**6**	5.2	0.4	0.3	1.3	0.0	7	14*
3262**	30	4	2.7	**7**	4.2	0.0	0.0	0.8	5.8	11	17
3434	**6**	**7***	**7.4**	**14**	**3.9**	**0.0**	**0.0**	**0.0**	**10.0**	**14**	**28***
3648	19	4	1.4	**5**	4.0	0.0	0.0	1.8	0.0	6	11
4971	16	8*	1.3	**9**	0.0	0.0	0.2	0.0	8.1	8	18*
4972	**33**	**8**	**2.4**	**10**	**1.5**	**0.0**	**0.0**	**0.0**	**10.0**	**12**	**22**
10228	**7**	**5***	**4.4**	**9**	**6.7**	**0.0**	**0.0**	**0.0**	**10.0**	**17**	**26***
10290	2	8*	0.0	**8**	0.0	0.0	0.0	0.0	10.0	10	18*
10307	**7**	**8***	**2.8**	**11**	**7.4**	**0.0**	**0.0**	**1.8**	**0.0**	**9**	**20***

* = Units that have estimated detrimental soil condition but not field verified.
** = Units where additional mitigation measures are recommended due to site-specific variations (see next page).

Units with additional mitigations due to soils concerns following field surveys:

1242 - springs in the unit; heavily impacted areas at the top of the unit and in headwaters of the stream to the south; subsoiling recommended for area in the north of the unit; springs in headwaters of southern stream; 34% DSC; trees visibly effected (see map)

Recommendations: subsoil top of unit. Either convert all to skyline harvests or subsoil and seed landings, temporary roads, and major skid trails after operations.

1257 - Very severe erosion hazard soils with springs throughout ground-based portion (see map)

Recommendations: convert ground-based to skyline

1323 - 7-8% DSC

Recommendations: subsoil and seed landings.

1364 - Old collapsing Humbolt bridge needs removed; 7-8% DSC

Recommendations: remove Humbolt bridge

1378 - Thin, rocky soils with heavy compaction along upper (northern) portion (see map); stunted tree growth

Recommendations: remove area with soil concerns, to flat to skyline

1421 - All of the proposed tractor harvests are too steep for equipment (40% +)

Recommendations: convert to skyline harvests

1446 - Area highlighted on map is heavily dissected with small streams (see map)

Recommendations: skyline with 50 foot buffers on all streams

1523 - Very steep access off of 1802000 road, >45%, too steep for mechanical access

Recommendations: drop or convert to skyline section of tractor harvest between 1802000 road and lower (northern) stream

1538 - Severe erosion hazard and springs throughout unit; highlighted areas have high concentration of residual disturbance (see map)

Recommendations: convert highlighted areas to skyline or remove from harvest consideration.

1539 - 15-20% DSC

Recommendations: drop or convert ground-based portion to skyline or subsoil all landings, temporary roads, and main skid trails after harvest

1566 - Ground-based portion of this unit has several springs with wetland species

Recommendations: removing unit from harvest consideration.

1658 - Steep (>40%) in sections that are accessed by 1824000 road (see map)

Recommendations: convert to skyline

1679 - Steep (>40%) in sections that are accessed by 1824000 road (see map)

Recommendations: convert to skyline

3262 - Steep (>40%) in sections that are accessed by 1824000 road (see map)

Recommendations: convert to skyline

Appendix E – Proposed Treatment Table

Table 35 displays for each unit and alternative the proposed logging system, thinning intensity, timber volume, and prescribed fuel treatment. Not displayed in the table is the concept of proposed gaps. Therefore, it is important to note that:

- Alternative 3 includes additional volume for 5 percent additional gaps.
- Alternative 2 has 15 percent or 385 acres in gaps, which equates to one 1-acre dominant tree release (117-foot radius) per 6.7 acres
- Alternative 3 has 16 percent or 410 acres in 1-acre gaps, and 4 percent or 103 acres in 3-acre gaps, which equates to one 1-acre dominant tree release per 6.3 acres, and one 3-acre dominant tree release (203-foot radius) per 25 acres.

In addition, the following notes help interpret elements of the table:

Thinning Intensity: Light = approx. 100 residual trees/acre, Moderate = approx. 75 residual trees/acre, Heavy = approx. 50 residual trees/acre

Fuels Treatment: LTA = leave tops attached (yarding tops), GP = grapple piling within unit along roads

Table 35. Proposed treatment units, acres, logging system, thinning intensity, timber volume and prescribed fuel treatment for Alternatives 2 and 3.

Unit Number	Acres	Logging System	Thinning Intensity	Total Timber Volume Alt. 2 (MBF)	Total Timber Volume Alt. 3 (MBF)	Fuel Treatment Alt. 2	Fuel Treatment Alt. 3
1160	4	Ground-based	Moderate	60	68	LTA/GP	LTA/GP
1200	20	Ground-based	Moderate	302	340	LTA/GP	LTA/GP
1200	31	Skyline	Moderate	468	527	LTA/GP	LTA/GP
1242	39	Ground-based	Moderate	608	684	LTA/GP	LTA/GP
1242	19	Helicopter	Moderate	296	333	GP	GP
1242	14	Skyline	Moderate	218	246	LTA/GP	LTA/GP
1257	13	Ground-based	Moderate	160	180	LTA/GP	LTA/GP
1257	36	Skyline	Moderate	443	498	LTA/GP	LTA/GP
1278	34	Skyline	Light	377	424	LTA/GP	LTA/GP
1296	11	Ground-based	Moderate	187	210	LTA/GP	LTA/GP
1296	51	Skyline	Moderate	867	975	LTA/GP	LTA/GP
1310	7	Ground-based	Moderate	119	134	LTA/GP	LTA
1310	12	Skyline	Moderate	204	230	LTA/GP	NT
1323	17	Ground-based	Moderate	272	306	LTA/GP	LTA/GP
1323	42	Skyline	Moderate	672	756	LTA/GP	LTA/GP

Unit Number	Acres	Logging System	Thinning Intensity	Total Timber Volume Alt. 2 (MBF)	Total Timber Volume Alt. 3 (MBF)	Fuel Treatment Alt. 2	Fuel Treatment Alt. 3
1364	5	Ground-based	Light	80	90	LTA/GP	LTA
1370	12	Ground-based	Moderate	194	218	LTA/GP	LTA/GP
1370	37	Skyline	Moderate	630	708	LTA/GP	LTA/GP
1378	13	Ground-based	Moderate	192	216	LTA/GP	LTA
1378	15	Skyline	Moderate	223	251	LTA/GP	LTA
1387	34	Ground-based	Moderate	540	608	LTA/GP	LTA
1387	29	Skyline	Moderate	463	521	LTA/GP	NT
1388	14	Ground-based	Light	238	268	LTA/GP	LTA/GP
1388	21	Skyline	Moderate	357	402	LTA/GP	LTA/GP
1394	32	Skyline	Moderate	483	543	LTA/GP	LTA/GP
1395	6	Ground-based	Moderate	98	110	LTA/GP	LTA
1395	6	Ground-based	Moderate	110	124	LTA/GP	LTA
1395	29	Skyline	Moderate	496	558	LTA/GP	NT
1402	33	Skyline	Moderate	562	632	LTA/GP	LTA/GP
1408	10	Ground-based	Moderate	170	191	LTA/GP	LTA/GP
1408	8	Skyline	Moderate	136	153	LTA/GP	LTA/GP
1411	22	Skyline	Moderate	380	427	LTA/GP	LTA
1412	6	Ground-based	Moderate	102	115	LTA/GP	LTA
1421	12	Ground-based	Moderate	200	225	LTA/GP	LTA/GP
1421	24	Skyline	Moderate	401	451	LTA/GP	LTA/GP
1426	34	Skyline	Moderate	503	566	LTA/GP	LTA/GP
1430	41	Skyline	Light	410	462	LTA/GP	NT
1432	35	Ground-based	Heavy	560	629	LTA/GP	LTA/GP
1432	13	Skyline	Moderate	208	234	LTA/GP	LTA
1435	26	Skyline	Moderate	359	404	LTA/GP	LTA/GP
1440	17	Ground-based	Moderate	333	375	LTA/GP	LTA/GP
1440	24	Skyline	Moderate	461	519	LTA/GP	LTA/GP
1443	21	Ground-based	Moderate	366	412	LTA/GP	LTA/GP
1443	13	Skyline	Moderate	194	218	LTA/GP	LTA/GP
1446	14	Ground-based	Moderate	224	252	LTA/GP	LTA/GP
1446	31	Skyline	Moderate	496	558	LTA/GP	LTA/GP

Unit Number	Acres	Logging System	Thinning Intensity	Total Timber Volume Alt. 2 (MBF)	Total Timber Volume Alt. 3 (MBF)	Fuel Treatment Alt. 2	Fuel Treatment Alt. 3
1451	39	Skyline	Moderate	585	658	LTA/GP	NT
1456	13	Ground-based	Moderate	237	266	LTA/GP	LTA
1456	30	Skyline	Moderate	535	602	LTA/GP	LTA
1470	19	Skyline	Moderate	325	365	LTA/GP	NT
1476	12	Skyline	Moderate	203	229	LTA/GP	NT
1477	45	Ground-based	Heavy	899	1011	LTA/GP	LTA/GP
1490	11	Ground-based	Light	160	180	LTA/GP	LTA/GP
1490	17	Skyline	Light	251	283	LTA/GP	LTA/GP
1493	9	Ground-based	Moderate	163	183	LTA/GP	LTA/GP
1493	30	Skyline	Moderate	451	508	LTA/GP	LTA/GP
1495	10	Ground-based	Moderate	178	200	LTA/GP	LTA
1495	8	Skyline	Moderate	140	157	NT	NT
1511	62	Ground-based	Moderate	938	1055	LTA/GP	LTA
1512	42	Ground-based	Moderate	580	652	LTA/GP	LTA
1512	8	Skyline	Moderate	108	122	LTA/GP	LTA
1514	18	Skyline	Moderate	290	326	LTA/GP	NT
1516	49	Ground-based	Moderate	809	910	LTA/GP	LTA/GP
1523	31	Ground-based	Moderate	608	684	LTA/GP	LTA/GP
1533	25	Ground-based	Moderate	375	422	LTA/GP	LTA/GP
1534	4	Ground-based	Heavy	59	66	LTA/GP	LTA/GP
1534	6	Skyline	Heavy	97	109	LTA/GP	LTA/GP
1537	17	Ground-based	Moderate	226	254	LTA/GP	LTA/GP
1537	18	Helicopter	Moderate	233	262	GP	GP
1537	9	Skyline	Moderate	120	135	LTA/GP	LTA/GP
1538	50	Ground-based	Moderate	706	794	LTA/GP	LTA/GP
1539	7	Ground-based	Light	124	140	LTA/GP	LTA/GP
1539	9	Skyline	Light	159	178	LTA/GP	LTA/GP
1546	20	Ground-based	Moderate	285	321	LTA/GP	LTA
1552	21	Ground-based	Moderate	288	324	LTA/GP	LTA/GP
1552	31	Skyline	Moderate	425	478	LTA/GP	LTA/GP
1566	6	Ground-based	Moderate	65	74	LTA/GP	LTA/GP

Unit Number	Acres	Logging System	Thinning Intensity	Total Timber Volume Alt. 2 (MBF)	Total Timber Volume Alt. 3 (MBF)	Fuel Treatment Alt. 2	Fuel Treatment Alt. 3
1566	17	Helicopter	Moderate	192	216	GP	GP
1566	46	Skyline	Moderate	685	771	LTA/GP	LTA/GP
1574	16	Ground-based	Moderate	255	287	LTA/GP	LTA/GP
1574	15	Skyline	Moderate	247	278	LTA/GP	LTA/GP
1575	28	Skyline	Moderate	92	104	LTA/GP	LTA
1576	36	Skyline	Heavy	605	680	LTA/GP	LTA
1577	8	Ground-based	Moderate	135	152	LTA/GP	LTA
1577	40	Skyline	Moderate	676	761	LTA/GP	LTA
1579	13	Helicopter	Heavy	250	281	GP	GP
1579	47	Skyline	Heavy	902	1015	LTA/GP	LTA/GP
1581	10	Skyline	Moderate	150	169	LTA/GP	LTA
1592	3	Ground-based	Moderate	48	54	LTA/GP	LTA
1592	11	Helicopter	Moderate	159	179	NT	NT
1592	16	Skyline	Moderate	246	277	LTA/GP	LTA
1594	16	Skyline	Moderate	240	270	LTA/GP	LTA
1596	12	Ground-based	Moderate	180	203	LTA/GP	LTA
1596	30	Skyline	Moderate	450	506	LTA/GP	NT
1601	17	Ground-based	Moderate	284	320	LTA/GP	LTA
1601	18	Helicopter	Moderate	301	338	NT	NT
1605	14	Skyline	Moderate	234	264	LTA/GP	LTA
1611	16	Ground-based	Heavy	355	400	LTA/GP	LTA
1611	16	Skyline	Heavy	355	400	LTA/GP	NT
1618	28	Skyline	Heavy	459	517	LTA/GP	NT
1619	10	Ground-based	Light	156	175	LTA/GP	LTA
1619	26	Helicopter	Moderate	393	442	GP	GP
1633	14	Ground-based	Moderate	211	238	LTA/GP	LTA
1633	9	Helicopter	Moderate	136	153	GP	NT
1633	8	Skyline	Moderate	121	136	LTA/GP	NT
1638	9	Skyline	Moderate	168	189	LTA/GP	NT
1639	17	Skyline	Heavy	289	325	LTA/GP	LTA/GP
1647	8	Ground-based	Moderate	113	127	LTA/GP	LTA

Unit Number	Acres	Logging System	Thinning Intensity	Total Timber Volume Alt. 2 (MBF)	Total Timber Volume Alt. 3 (MBF)	Fuel Treatment Alt. 2	Fuel Treatment Alt. 3
1649	13	Ground-based	Moderate	200	225	LTA/GP	LTA/GP
1649	7	Skyline	Moderate	102	115	LTA/GP	LTA/GP
1649	12	Skyline	Moderate	177	199	LTA/GP	LTA/GP
1658	35	Ground-based	Moderate	623	701	LTA/GP	LTA/GP
1658	23	Skyline	Moderate	409	461	LTA/GP	LTA/GP
1679	6	Ground-based	Moderate	98	110	LTA/GP	LTA/GP
1679	28	Skyline	Moderate	453	510	LTA/GP	LTA/GP
1701	7	Ground-based	Moderate	106	119	LTA/GP	LTA/GP
1701	3	Skyline	Moderate	45	51	LTA/GP	LTA/GP
1714	21	Ground-based	Moderate	336	378	LTA/GP	LTA/GP
1714	9	Helicopter	Moderate	141	159	NT	NT
1714	13	Skyline	Moderate	215	242	LTA/GP	LTA/GP
1732	9	Helicopter	Moderate	153	172	GP	NT
1732	24	Skyline	Moderate	416	468	LTA/GP	LTA
3262	5	Ground-based	Moderate	80	90	LTA/GP	LTA/GP
3262	12	Ground-based	Moderate	176	198	LTA/GP	LTA/GP
3262	12	Skyline	Moderate	187	211	LTA/GP	LTA/GP
3434	6	Ground-based	Moderate	109	123	LTA/GP	LTA
3648	19	Skyline	Moderate	323	363	LTA/GP	NT
4971	16	Ground-based	Moderate	240	270	LTA/GP	LTA
4972	33	Ground-based	Moderate	557	626	LTA/GP	LTA
10228	7	Ground-based	Light	112	125	LTA/GP	LTA
10290	2	Ground-based	Light	25	28	LTA/GP	LTA
10307	7	Skyline	Moderate	115	129	LTA/GP	NT
	2,564	Totals		40,529	45,596		