

FINDING OF NO SIGNIFICANT IMPACT, AND ENVIRONMENTAL ASSESSMENT

The Roaring Creek Projects

**Commercial Density Management Thinning,
Fish Habitat Restoration,
Wildlife Habitat Enhancement**

November 2007



BLM/OR/WA/PT-07/007+1792

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering economic use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

Environmental Assessment Number OR-086-07-02

The Roaring Creek Projects

Finding of No Significance, and Environmental Assessment

November 1, 2007

United States Department of the Interior
Bureau of Land Management, Oregon State Office
Salem District, Tillamook Resource Area
Washington and Yamhill Counties, Oregon

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Abstract: The Bureau of Land Management proposes to conduct three different projects in the Middle and Upper Tualatin River subwatersheds on federal lands in the Adaptive Management Area, Late Successional Reserve and Riparian Reserve land use allocations. The first project is a commercial density management thinning of approximately 906 acres that would also build about 4.0 miles of new temporary roads, renovate about 5.6 miles of existing roads and decommission about 6.6 miles of existing roads. The second project is a fish habitat restoration project in Roaring Creek that would use large wood to increase channel complexity in 1.1 miles of stream and also decommission approximately 1.4 miles of existing road. The third project is a wildlife habitat enhancement treatment on approximately 323 acres. These actions would occur on federal land in portions of T.1S, R.5W, sections 19, 29, 31, 33, 34 and 35; T.1S, R.6W, section 25 and T.2S, R.5W, sections 1, and 3; Willamette Meridian.

FINDING OF NO SIGNIFICANT IMPACT

Introduction

The Roaring Creek Projects Environmental Assessment (EA) documents the environmental analysis of the proposed projects. The EA is attached to and incorporated by reference in this Finding of No Significant Impact determination (FONSI). The EA analyzes commercial density management thinning on approximately 906 acres of 36-75 year old, relatively dense Douglas-fir stands; Fish habitat restoration activities along 1.1 miles of stream segments that would not be treated with density management, and decommissioning of approximately 1.4 miles of existing road; and wildlife habitat enhancement treatment on approximately 323 acres that would not be treated with density management. The project areas include T.1S, R.5W, sections 19, 29, 31, 33, 34 and 35; T.1S, R.6W, section 25 and T.2S, R.5W, sections 1, and 3; Willamette Meridian

The EA and FONSI will be made available for public review from **November 9, 2007** to **December 10, 2007**. The notice for public comment will be published legal notices by the Forest Grove Argus and McMinnville News Register newspapers. Comments received by the Tillamook Resource Area of the Salem District Office, 4610 Third Street, Tillamook, Oregon, 97141, on or before **December 10, 2007** will be considered in making the final decisions for these projects.

Finding of No Significant Impact

Based upon review of the Roaring Creek Projects EA and supporting project record, I have determined that these projects are not major federal actions and would not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27. There are no site specific impacts that would require supplemental/additional information to the analysis done in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS). Therefore, an environmental impact statement is not needed. This finding is based on the following discussion:

Context. The proposed projects are site-specific actions directly involving a total of 1,229 acres of BLM administered land, along with actions occurring on various haul routes, and treatments along 1.1 miles of stream. These actions by themselves do not have international, national, region-wide, or state-wide importance.

The discussion of the significance criteria that follows applies to the intended actions and is within the context of local importance. The EA details the effects of the action alternatives; none of the effects identified, including direct, indirect and cumulative effects, are considered to be significant and do not exceed those effects described in the RMP/FEIS.

Intensity. The following discussion is organized around the Ten Significance Criteria described in 40 CFR 1508.27. The discussions below apply to all three projects contained within the Roaring Creek Projects Environmental Assessment.

- Impacts may be both beneficial and adverse.** Due to the proposed projects' design features, the most noteworthy predicted effects include: (1) acceleration of the development of some late-successional forest structural features on about 906 acres using density management and an additional 323 acres of wildlife habitat enhancement projects. These activities include the development of large trees, gaps in the canopy, snags and down wood, various levels of overstory tree densities; (2) enhancement of the overall level of diversity in the area; (3) increased structural diversity in 1.1 miles of fish-bearing streams; (4) consistency with the ACS

(Aquatic Conservation Strategy) objectives; (5) no loss in population viability of special status or special attention species (also see significance criteria #9 below); (6) slight, short-term increases in sediment are anticipated from road construction, road improvement and culvert removal, timber harvest, log haul and fish habitat enhancement activities; (7) no impacts to water temperature, streamflow or stream channel stability; and (8) social and economic benefits to the local communities through the supply of timber to local mills and some contract work associated with the wildlife habitat enhancement and fish habitat restoration projects.

None of the environmental effects disclosed above and discussed in detail in Chapters 2, 3 and 4 of the EA and associated appendices are considered significant, nor do the effects exceed those described in the RMP/FEIS.

2. The degree to which the selected alternative will affect public health or safety. Public health and safety was not identified as an issue. The proposed projects are comparable to other density management, fish habitat enhancement, and wildlife habitat enhancement which have occurred within the Salem District with no unusual health or safety concerns.

3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farm lands, wetlands, wild and scenic rivers, or ecologically critical areas. There are no park lands, prime farm lands, or wildernesses located within the project area (EA, Appendix 2). No cultural resource sites have been identified within the project area. There are no federally designated Wild and Scenic Rivers within the project area. Under the design features for the density management treatments, all identified wetland and riparian areas would be buffered to protect resource values. Activities associated with the proposed fish enhancement and wildlife enhancement projects are designed to accelerate the development of some late-successional forest structural features and are not predicted to impact wetlands. There are no Areas of Critical Environmental Concern or other known ecologically critical areas within or adjacent to the project area.

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial. Extensive scoping of the proposed projects resulted in only one project specific comment letter. The disposition of public comments is contained in Appendix 1 of the EA.

The effects of the proposed projects on the quality of the human environment were adequately understood by the interdisciplinary team to provide an environmental analysis. A complete disclosure of the predicted effects of the proposed projects is contained within Chapters 2, 3 and 4 of the EA and associated appendices.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks. The proposed projects are not unique or unusual. The BLM has experience implementing similar projects in similar areas and have found effects to be reasonably predictable. The environmental effects to the human environment are fully analyzed in the EA. There are no predicted effects on the human environment which are considered to be highly uncertain or involve unique or unknown risks.

6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration. The proposed projects do not set a precedent for future actions that may have significant effects, nor do they represent a decision in principle about a future consideration. Any future projects will be evaluated through the NEPA (National Environmental Policy Act) process and will stand on their own as to environmental effects.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. The interdisciplinary team evaluated the proposed projects in context of past, present and reasonably foreseeable actions Appendix 3. No cumulative effects have been identified. A complete disclosure of the effects of the action alternatives is contained in Chapter 2, 3 and 4 of the EA.

8. The degree to which the action may adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources. The proposed projects will not adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places, nor will the proposed projects cause loss or destruction of significant scientific, cultural, or historical resources (EA, Appendix 2).

9. The degree to which the action may adversely affect an endangered or threatened species or its designated critical habitat under the Endangered Species Act of 1973. In accordance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended, informal or formal consultation with the US Fish and Wildlife Service (USFWS) concerning the potential impacts of the Roaring Creek Density Management Project, Fish Habitat Enhancement Project and Wildlife Habitat Enhancement Project upon the spotted owl, marbled murrelet and bald eagle would be completed by including the appropriate project within the programmatic habitat modification biological assessment prepared by the interagency Level 1 Team (terrestrial subgroup) for the North Coast Province. The projects would be submitted for inclusion in the appropriate programmatic consultation. If any of the projects are determined to not be in compliance with the standards of the programmatic consultation, the project would be changed to be in compliance with the programmatic consultation or a project-specific consultation would be conducted. In either case, all of the appropriate Terms and Conditions of the appropriate Biological Opinion would be incorporated.

Any ESA consultation with USFWS required on the subsequent maintenance of trees planted as a part of this project would likely be accomplished by inclusion of the maintenance work within the appropriate Programmatic Biological Assessment for Activities in the North Coast Province which might disturb bald eagles, northern spotted owls or marbled murrelets which is prepared by the North Coast Province Interagency Level 1 Team.

In accordance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended, there are no impacts to listed or proposed fish species within the action areas.

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. The proposed projects do not violate any known Federal, State, or local law or requirement imposed for the protection of the environment. The EA and supporting Project Record contain discussions pertaining to the Endangered Species Act, National Historic Preservation Act, Clean Water Act, Clean Air Act, Coastal Zone Manage Act, Executive Order 12898 (Environmental Justice), Oregon Scenic Waterways Act, and Executive Order 13212 (Adverse Energy Impact). State, local, and tribal interests were given the opportunity to participate in the environmental analysis process. Furthermore, the proposed projects are consistent with applicable land management plans, policies, and programs.

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Approved by: _____ Date _____
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ENVIRONMENTAL ASSESSMENT

1. INTRODUCTION

The Roaring Creek Environmental Assessment covers a subwatershed-wide forest management and restoration effort proposed by the Tillamook Resource Area. It contains three distinct project types which collectively would help to move the subwatershed toward the Desired Future Condition. These projects include a commercial density management thinning project, a fish habitat restoration project, and a wildlife habitat enhancement project.

The projects presented in this Environmental Assessment are the products of the Tillamook Resource Area's integrated planning processes which utilized an interdisciplinary planning approach to identify potential management projects on BLM lands. The largest scale of planning considered all BLM lands within the Tillamook Resource Area and applied eleven rating criteria which reflected various management directions, concerns or objectives (e.g. Key Watershed Status, Clean Water Act, Land Use Allocations, Silvicultural Needs Assessment, and Transportation - including both access issues and restoration needs). This analysis resulted in the identification of the Scoggins/Tualatin Watershed as a high priority for management. The final scale of planning considered all lands within the Scoggins Activity Planning Unit (APU), and in light of APU-specific Planning Issues compared current resource conditions to the management objectives and Desired Future Conditions of the area. The projects included in this Environmental Assessment were identified during this Activity Planning Process.

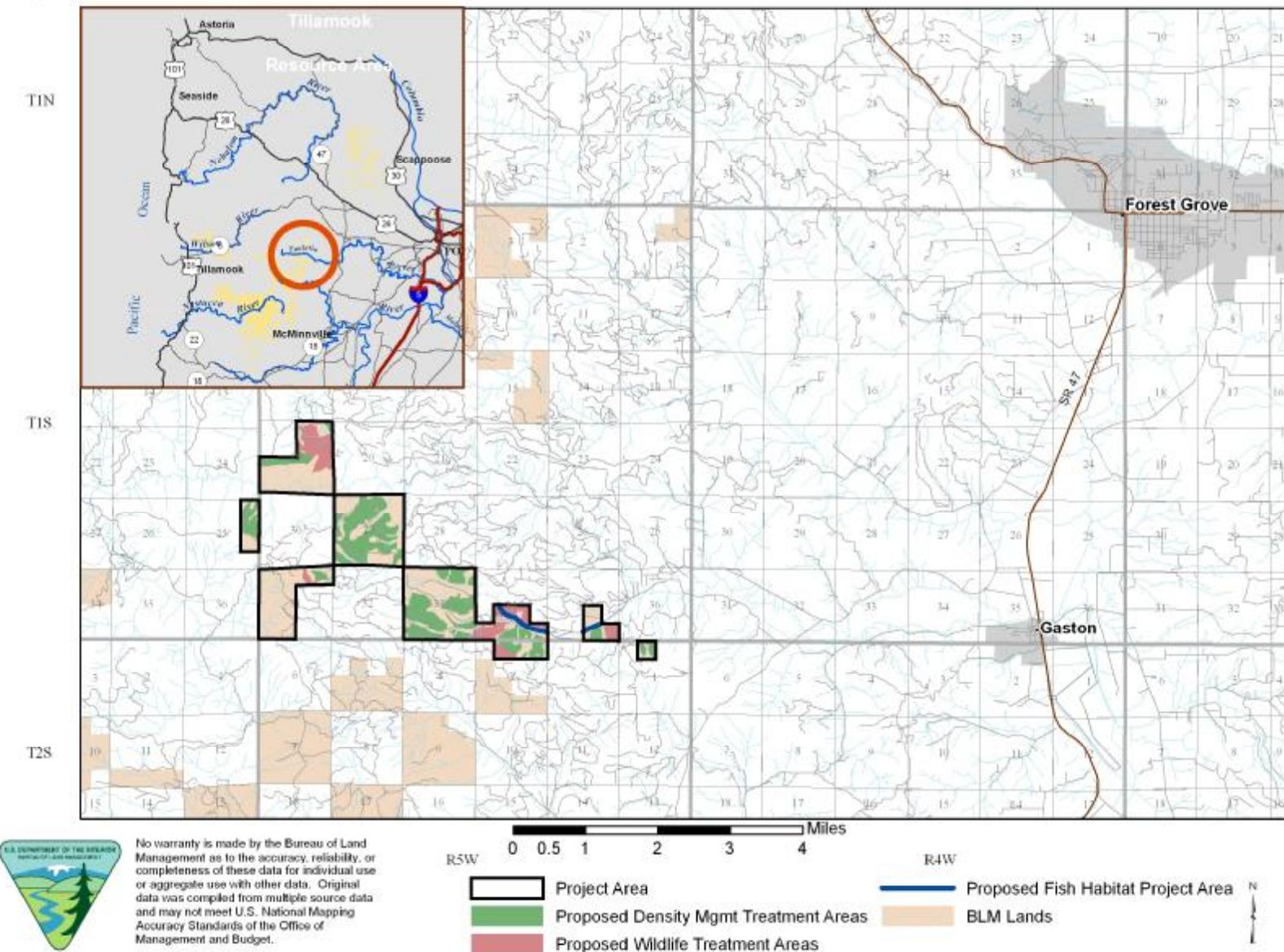
1.1 Project Location

The project areas are approximately 10 miles southwest of the town of Forest Grove, Oregon, in the Roaring Creek and Tualatin River watersheds. (Figure 1). The project areas include T.1S, R.5W, sections 19, 29, 31, 33, 34, and 35; T.1S, R.6W, section 25; and T.2S, R.5W, sections 1 and 3, Willamette Meridian.

The proposed project areas are located on Oregon and California Railroad Lands (O & C Lands), within the Northern Coast Range Adaptive Management Area (AMA), Late Successional Reserve (LSR), and Riparian Reserve (RR) land-use allocations.

The Roaring Creek project is set in a context of Federal lands being distributed in a scattered, non-contiguous or "checkerboard" fashion with parcels of Federal lands commonly being less than a full section in size, and are surrounded by and intermingled with non-Federal forestland primarily owned by industrial timber companies that are primarily managed for timber production on short rotations. Management practices on industrial timberlands tend to dominate the character of the forested landscape containing the Roaring Creek Projects.

Figure 1 - Roaring Creek Projects Location Map



1.2 Conformance with Land Use Plans, Policies and Programs

Timber management on the Revested Oregon and California Railroad Lands (O&C Lands) managed by the Tillamook Resource Area is principally authorized and guided by:

The Oregon and California Act of 1937: Section 1 of the O&C Act stipulates that suitable commercial forest lands revested by the government from the Oregon and California Railroad are to be managed for the sustained production of timber.

The Federal Land Policy and Management Act (FLPMA): Section 302 at 43 U.S.C. 1732(a), directs that “The Secretary shall manage the public lands . . . in accordance with the land use plans developed by him under section 202 of this Act when they are available . . .”

Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD/FSEIS): The ROD/FSEIS (USDA Forest Service and USDI BLM, 1994) provides goals, standards and guidelines for management of the Northern Coast Range AMA.

Salem District Record of Decision/Resource Management Plan (ROD/RMP): The ROD/RMP (USDI BLM 1995a), approved in accordance with the requirements of FLPMA, provides specific direction for resource management, including fisheries and wildlife habitat, transportation and timber management.

Late Successional Reserve Assessment for Oregon’s Northern Coast Range Adaptive Management Area (LSRA): The LSRA (USDA Forest Service and USDI BLM, 1998) identifies priorities for treating timber stands to meet management goals for the AMA and LSR.

This EA will consider the environmental consequences of the proposed action and no action alternatives in order to provide sufficient evidence for determining whether the anticipated impacts would exceed those considered in the Salem District PRMP/EIS and require the preparation of a Supplemental Environmental Impact Statement (SEIS). In addition to the PRMP/EIS, this analysis is tiered to assumptions and analysis of consequences provided by:

- The *Final Supplemental Environmental Impact Statement (FSEIS) on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl* (USDA, USDI 1994a) (Northwest Forest Plan);
- The *FSEIS for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA, USDI 2001a);

Implementation of the proposed action would conform to the requirements of the ROD/RMP which incorporates as management direction the standards and guidelines of the *Record of Decision for Amendments (ROD) to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA, USDI 1994b), as amended by the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA, USDI 2001b (S&M ROD)). Conformance with the 2001 S&M ROD includes implementation of the 2001, 2002, 2003 *Survey and Manage Annual Species Reviews*. Additionally, implementation of the proposed action would conform to the requirements of the *Coastal Zone Management Act*

of 1974, as amended, and the *Endangered Species Act of 1972* (ESA), as amended. The proposed action also conforms to the *Upper Tualatin-Scoggins Watershed Analysis* (February, 2000).

Tillamook Resource Area is aware of the August 1, 2005, U.S. District Court order in *Northwest Ecosystem Alliance et al. v. Rey et al.* which found portions of the *Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (January, 2004) (EIS) inadequate. Tillamook Resource Area is also aware of the recent January 9, 2006, Court order which:

- set aside the 2004 Record of Decision *To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern spotted Owl* (March, 2004) (2004 ROD) and
- reinstated the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* (January, 2001) (2001 ROD), including any amendments or modifications in effect as of March 21, 2004.

However, on October 11, 2006, the U.S. District Court entered further Order, amending paragraph three of the January 9, 2006 injunction. This most recent Order directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

- a. Thinning projects in stands younger than 80 years old;
- b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
- c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions; and
- d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

BLM has reexamined the objectives of the Roaring Creek Projects as described in this Environmental Assessment (section 2.1.1). The Density Management Project would thin stands that are less than 80 years old and may involve installing, replacing or removing culverts and waterbarring and blocking roads to vehicle traffic. This project falls within exemptions a, b and c, above, regarding thinning projects in stands younger than 80 years old, road decommissioning and removing culverts. The Fish Habitat Restoration Project involves riparian and in-stream work such as planting trees and placing large wood and/or boulders to improve habitat conditions in the stream, as well as road decommissioning. This project falls within exemptions b and c, above, regarding road decommissioning and riparian and stream improvement projects. The Wildlife Habitat Enhancement Project would create CWD in targeted stands through girdling, topping and falling trees. This project is not ground-disturbing and does not require surveys. For the foregoing reasons, it is my determination that the Roaring Creek Projects meet exemptions a, b and c above, and this decision is in compliance with the District Court ruling as stated on page 1 of the October, 11, 2006, Order in Northwest Ecosystem Alliance et al. v. Rey et al.

On July 25, 2007, the Under Secretary of the Department of Interior signed a new Survey and Manage Record of Decision¹ that removed the survey and manage requirements from all of the BLM resource management plans (RMPs) within the range of the northern spotted owl. In any case, these projects fall within at least one of the exceptions listed in the modified October 11, 2006 injunction.

1.3 Decisions to be Made

The Tillamook Field Manager is the official responsible for deciding whether or not to prepare an Environmental Impact Statement (EIS), and whether to approve the Roaring Creek Density Management Thinning, Fish Habitat Restoration, and/or the Wildlife Habitat Enhancement projects as proposed, not at all, or to some other extent.

2. PROJECT 1 – Commercial Density Management Thinning

2.1 Purpose of and Need for Action

2.1.1 Objectives

By comparing the existing conditions of the landscape in the project area to the management direction contained in the ROD/FSEIS and Salem ROD/RMP, the IDT identified a number of specific resource conditions that do not meet the long-term management objectives. The proposed action is designed to modify these conditions, and move towards achieving the management direction described in the ROD/FSEIS and ROD/RMP.

The objectives of this project are to:

- 1) Implement the following management direction from the ROD/RMP, pertaining to management of lands in the LSR, AMA and Riparian Reserve land use allocations.
 - Produce a sustainable supply of timber and other forest commodities (p. 46);
 - Manage timber stands to reduce the risk of loss from disease (p. 46);
 - If needed to create and maintain late-successional forest conditions, conduct thinning operations in forest stands up to the 110-year age class (p. 15);
 - Manage developing stands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood and timber value at harvest (pg. 46);
 - Provide for the maintenance of ecologically valuable structural components such as down logs, snags, large trees (pg. 20);
 - Reduce road density by closing roads that are no longer needed for management activities and that are

¹

Complete Title: Record of Decision To Remove the Survey and Manage Mitigation Measure Standards and Guidelines from Forest Service Land and Resource Management Plans Within the Range of the Northern Spotted Owl

contributing to water quality degradation (ROD/RMP p.64);

- Meet Aquatic Conservation Strategy (ACS) requirements by “...closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to ACS objectives and considering short-term and long-term transportation needs” (ROD/RMP p.62).
- 2) Contribute a sustainable supply of timber in support of the PRMP/EIS (Vol. 1, p. xii) assumptions that BLM management programs (including timber sales) would support 544 jobs and provide \$9.333 million in personal income annually.
- 3) Comply with Section 1 of the O&C Act (43 USC § 1181a) which stipulates that O&C Lands be managed “... for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities...”.

2.1.2 Decision Factors

Factors to be considered when selecting among alternatives will include:

- The degree to which the objectives previously described would be achieved including: the manner in which timber harvest would be conducted with respect to the type(s) of equipment and method of yarding to be employed, as well as the season(s) of operations; and the manner in which access would be provided, including road renovation, and the type and location of any road construction;
- The nature and intensity of environmental impacts that would result from implementation and the nature and effectiveness of measures to mitigate impacts to resources including, but not limited to wildlife and wildlife habitat, soil productivity, water quality, and air quality;
- Compliance with: management direction from the ROD/RMP; terms of consultation on species listed and habitat designated under the Endangered Species Act; the Clean Water Act, Clean Air Act, Safe Drinking Water Act and O&C Act; and other programs such as Special Status and Survey & Manage Species.
- Economics
 - 1. Provide timber resources and provide revenue to the government from the sale of those resources;
 - 2. Reduce the costs both short-term and long-term of managing the lands in the project area.

2.2 Alternatives

2.2.1 Alternative Development

On October 3, 2006 a Scoping Letter (Project Record Document 3) was sent to 35 individuals, organizations and agencies (Project Record Document 4). As a result of this scoping effort, one letter providing comments was received (Project Record Document 15). The main concern identified through scoping was that there may be cumulative watershed effects resulting from the high levels of recent timber harvest and road construction on private lands in the watershed. Based on this concern, the IDT considered an alternative that would minimize the amount of new road construction. This alternative was considered but not fully analyzed because it was determined that it would not have a meaningful difference in environmental impacts from the proposed action alternative (see section 2.2.4).

Pursuant to Section 102(2) (E) of NEPA (National Environmental Policy Act of 1969, as amended), Federal agencies shall “...study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.” No unresolved conflicts concerning alternative uses of available resources (section 102(2) (E) of NEPA) were identified. No alternatives were identified that would meet the purpose and need of the project and have meaningful differences in environmental effects from the Proposed Action. Therefore, this EA will analyze the effects of the “Proposed Action” and the “No Action Alternative”.

2.2.2 Alternative 1: No Action

The BLM would not implement the commercial density management thinning project at this time. Existing roads would continue to age over time with little or no road surface or drainage structure maintenance. The plant and animal communities would continue to be dependant upon the current stand development trajectories and ecological processes, and management objectives would not be met.

2.2.3 Alternative 2: The Proposed Action

The proposed action would treat approximately 906 acres of predominantly Douglas-fir stands (Figure 2) by thinning from below in a variable-spaced manner by removing 28 to 62% of the basal area and approximately 42 to 83% of the trees per acre. In general, the larger-diameter conifers with relatively high live crown ratios and healthy appearing crowns would be retained, regardless of spacing. Thinning would occur only in the Douglas-fir component because it is the most abundant species, and existing western hemlock and western redcedar in the understory would be retained to encourage *mixed-species* stands. All hardwood trees are to be retained and counted toward achieving the recommended basal area target levels. As identified in the LSRA, trees greater than or equal to the diameter cutting limits shall be reserved from harvest; any of these larger trees incidentally felled to facilitate harvest would be left on site as coarse woody debris.

To achieve variability in density within units it is advisable to enhance the current stand structure. A wider tree spacing would be encouraged where trees are already more widely spaced, and spacing would be somewhat closer where trees are more tightly spaced to accentuate the variation in density that is already present in some stands. To further enhance variability within stands the basal area would be varied by $\pm 25\%$ to achieve an average equaling the target basal area for each stand. To encourage a more variable spatial distribution among units, stands would be altered from their current relatively *uniform* tree distribution spatial pattern to a more *random* spatial pattern, with interspersed gaps and untreated areas among units.

In *Phellinus weiri* root disease centers not identified in the special *P. weiri* infection area, increase spacing to 30 feet around live symptomatic or dead trees, or stumps infected with *P. weiri*. A diameter cut limit of greater than or equal to 30 inches would apply to those trees within the 30 foot spacing requirement. Those trees greater than or equal to 30 inches would be left to provide snags, and future coarse woody debris. If present, conifers other than Douglas-fir or grand fir, and hardwoods would be retained.

Treatment of P. weiri root disease centers

No reforestation treatments are recommended for small scattered areas less than one-acre in size that are infested with *P. weiri*.

Well-defined root disease pockets exceeding one acre may be reforested with disease-tolerant conifers such as western redcedar, western white pine, or hardwoods such as red alder or bigleaf maple (all hardwoods are immune to *P. weiri* root rot).

Piling and burning the piles may be necessary in *Phellinus* pockets where slash loads severely limit reforestation efforts. Slash would be piled away from the leave trees.

Root disease centers would *not* be treated within Riparian Reserves.

Riparian Reserves

The Riparian Reserve land use allocation encompasses one site-potential tree on non-fish-bearing streams and two site-potential trees on fish-bearing streams. The site-potential tree heights range from 200 to 260 feet in the project area, with an average of 240 feet. Approximately 27% of the proposed density management (about 244 acres) would occur within Riparian Reserves. These Riparian Reserve treatments would occur outside “no-harvest” buffers that would be placed along streams; in general there would be a 60’ no-harvest buffer along non-fish-bearing streams and 100’ no-harvest buffers along fish-bearing streams. Restrictions would apply on ground-based logging equipment within Riparian Reserves which would effectively result in some of the no-harvest buffers adjacent to ground-based yarding units being increased in width to up to approximately 180 feet.

In general, the proposed treatments would be similar in both the Riparian Reserve and in the upland areas; exceptions include the design feature that no gaps would be created within Riparian Reserves.

Table 1. Land Use Allocations and Logging Systems for Proposed Density Management Thinning Units

<i>Unit Number</i>	<i>AMA Acres</i>	<i>AMR Acres</i>	<i>Riparian Reserve Acres</i>	<i>Total Acres</i>	<i>Logging Systems (acres)</i>	
					<i>Ground-based</i>	<i>Skyline</i>
1-1	9.9	0.0	12.7	22.6	22.6	0.0
3-1	13.0	5.5	12.4	30.9	30.9	0.0
19-1	0.0	2.9	4.4	7.3	0.0	7.3
19-4	0.0	19.6	0.0	19.6	19.6	0.0
19-5	0.0	35.7	0.0	35.7	35.7	0.0
25-1	10.6	0.0	11.0	21.6	9.3	12.3
25-2	29.1	0.0	8.7	37.8	30.6	7.2
29-1	141.2	0.0	35.4	176.6	152.1	24.5
29-2	45.4	0.0	4.9	50.3	0.0	50.3
29-3	59.1	0.0	25.5	84.6	4.9	79.7
29-4	5.3	0.0	4.5	9.8	0.0	9.8
31-1	7.3	0.0	5.3	12.6	12.6	0.0
31-2	1.2	0.0	2.1	3.3	3.3	0.0
33-1	236.0	0.0	71.2	307.2	180.1	127.1
34-1	33.9	0.0	34.3	68.2	17.2	51.0
35-1	6.7	0.0	11.7	18.4	8.1	10.3
Totals	598.7	63.7	244.1	906.5	527	379.5

Connected Actions

Road Work

New Road Construction: Approximately 4 miles of new road construction would occur (Figure 3). All new roads would be natural-surface (no rock would be added). No new stream crossing culverts would be installed. New roads and landings would be decommissioned and blocked following

timber harvest and site preparation activities. Treatment area accessed by new road construction is shown in Table 2.

Table 2. New Road Construction: Estimated Acres Accessed by Each Newly Constructed Road Segment.

Spur Number	Approximate Length (feet)	Approximate Area Accessed (acres)
P3-1	1,470	22
P3-2	1,200	16
P3-3	2,000	30
P19-1	1,720	55
P25-1	1,030	14
P29-1	1,760	16
P29-2	1,730	110
P33-1	560	10
P33-2	350	7
P33-3	1180	80
P33-4	2,090	50
P33-5	1,970	56
P33-6	250	9
P33-7	730	25
P33-8	620	20
P35-1	1,860	18
TOTAL	20,520 feet	538 acres

Road Renovation: Up to 5.6 miles of existing roads under BLM and private control would be renovated as necessary to accommodate log-hauling. This would include brushing, blading, drainage structure improvement or replacement, and spot rocking at deficient locations. Most of the roads to be renovated are natural-surface and they would remain natural-surface following renovation. Renovated roads would be decommissioned and blocked following timber harvest and site preparation activities.

Road Decommissioning: In addition to the new road construction and renovated roads, another 1.0 miles of existing natural-surface road would be decommissioned. Decommissioning would consist of removing culverts, decompacting, water barring, seeding or planting with native species, and restricting OHV use. Restricting OHV use may include the strategic placement of boulders, logs, root wads, or other types of earthen barriers.

Fuels Treatments

Fuel treatment strategies would be implemented on portions of the project areas. Strategies would include directional falling (to keep slash away from fuel breaks), followed by a reduction of surface

fuels in order to reduce both the intensity and severity of potential wildfires in the long term (after fuels reduction has occurred).

Fuels reduction would be accomplished by burning of slash piles, which would be created by hand or mechanical methods.

Figure 2 - Density Management Project Treatment Areas

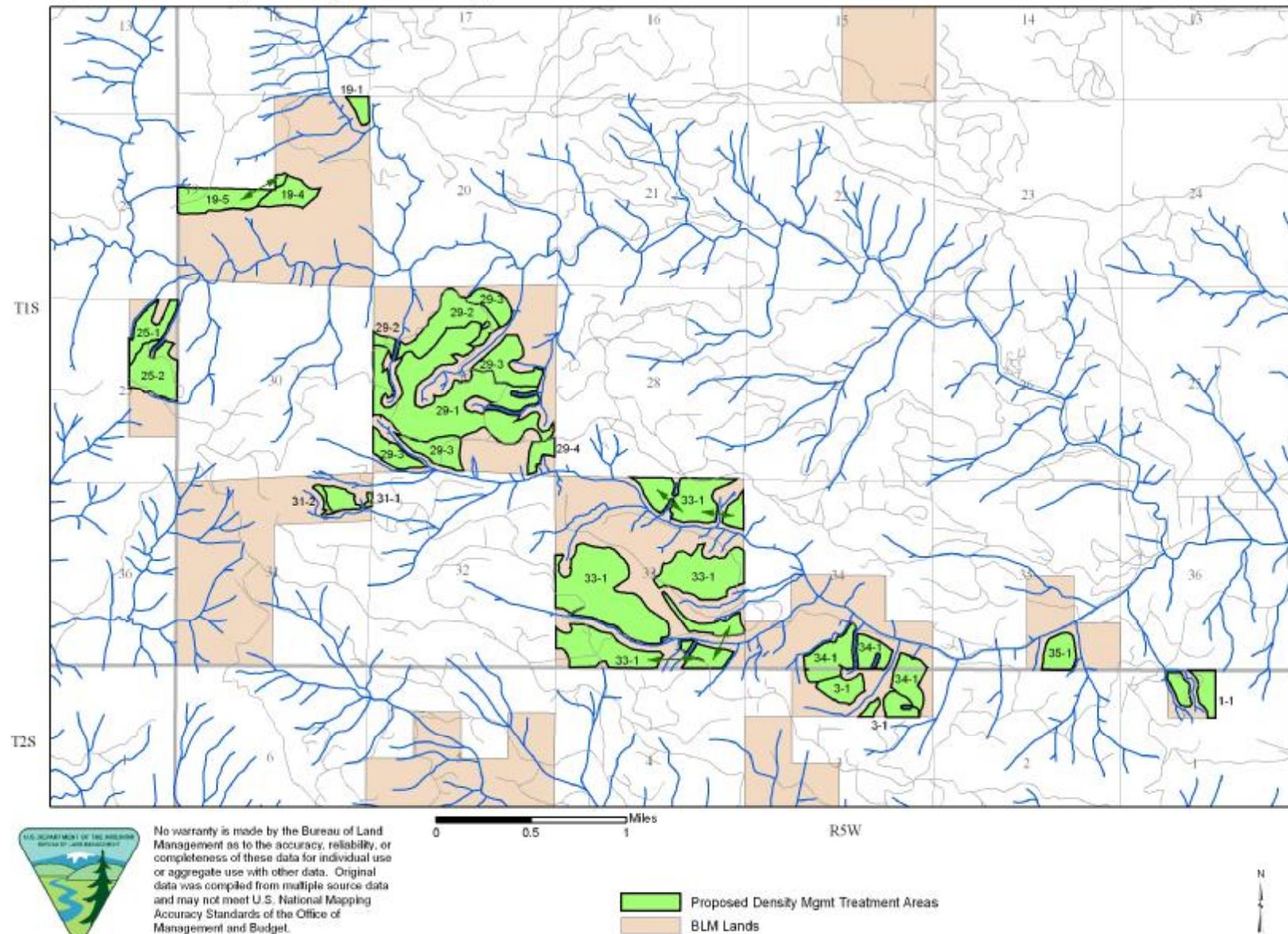
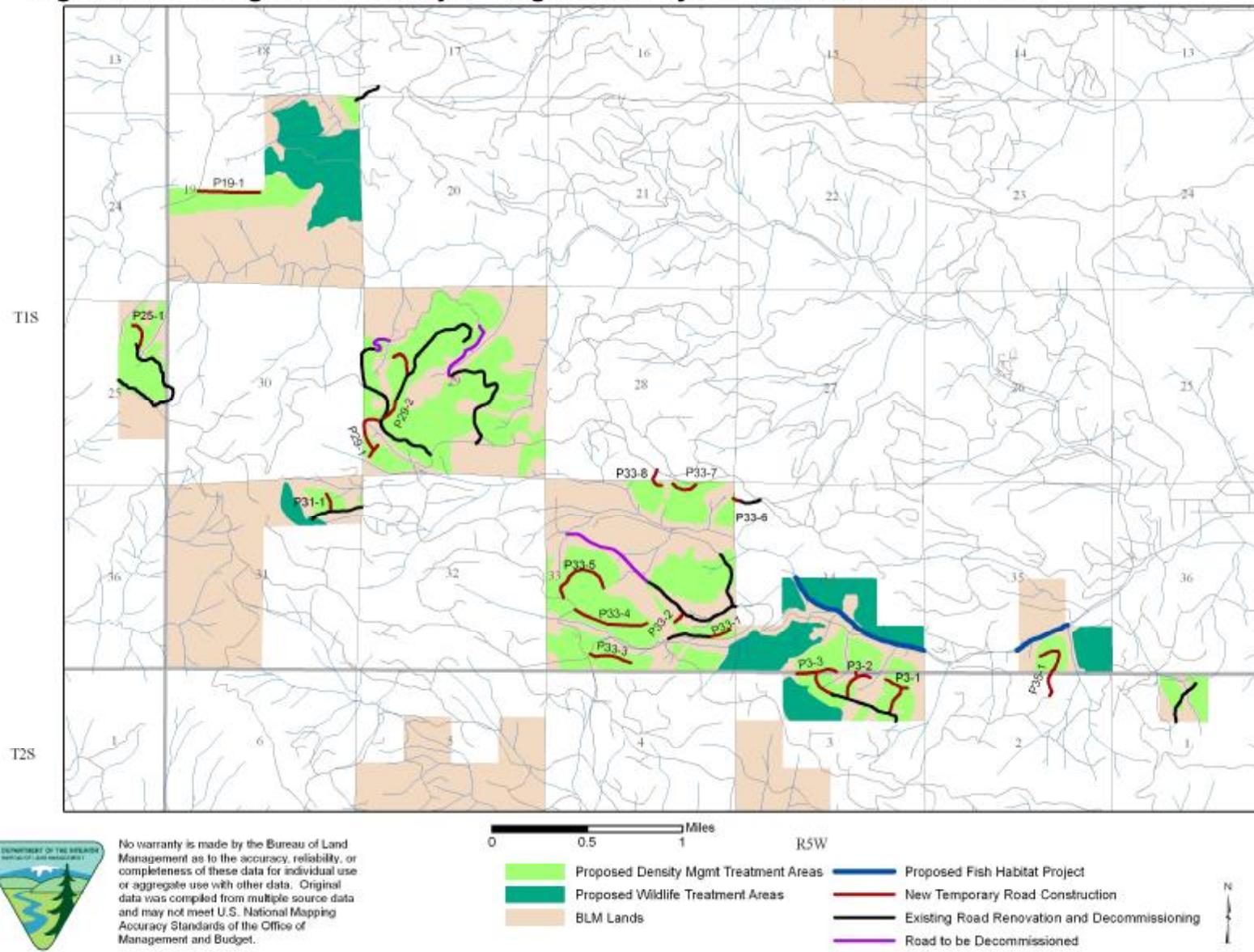


Figure 3 - Roaring Creek Density Management Project - Connected Road Work



Project Design Features

The following is a summary of the design features that reduce the risk of effects to the affected elements of the environment. The proposed action would be implemented consistent with the Best Management Practices (BMPs) contained in Appendix C of the ROD/RMP.

The design features are organized below by benefiting resource.

Desirable Stand Features, Diversity, and Protection

- § Remove trees primarily from the Douglas-fir component in a variable-spaced manner to the recommended basal area, with the following exceptions: retain trees that have significant defect, cavities, or dead or broken tops. Retain full-crowned smaller Douglas-fir, plus trees (trees selected for genetic traits) and their reference trees, and bearing trees. Retain all hardwoods, western hemlock, grand fir (outside of *P. weiri* disease centers), and western redcedar.
- § In large *P. weiri* disease centers, trees with obvious symptoms and low-vigor trees would be removed to 30 feet beyond the outer limits of the pocket.
- § Implement approximately 66 acres of heavy thinning treatment, typically ranging from ¼ to two acres in size, around identified *P. weiri* disease centers. An average of 20 trees per acre would be retained in the heavy thinning treatment areas. Susceptible trees (Douglas-fir and grand fir) that surround the boundary of obvious infection centers would be removed to reduce the potential for disease to spread to adjacent healthy parts of the stand through root contact. Susceptible trees greater than 30 inches dbh may be cut and left as down wood. Standing red alder may be cut in these areas if beneficial to meeting conifer regeneration needs and to help protect planted seedlings from deer and elk browse.
- § For the resulting open patches, plant a mixture of shade-tolerant and *P. weiri* disease resistant conifers, to begin the formation of a second canopy layer.
- § Leave islands would be located to protect concentrations of snags and logs, to increase coarse woody debris recruitment needs along stream influence zones, and where features or stand structure would benefit from higher tree density (e.g. slopes over 70%).
- § Where cable yarding corridors converge near landings, open areas within a 100-foot radius downhill of the landings would be planted with shade-tolerant conifer seedlings such as western redcedar, or western hemlock.
- § Log lengths would be limited to 40 feet plus trim to reduce the potential for excessive residual stand damage. If determined necessary by the Authorized Officer, log lengths would be reduced on specific corridors to achieve full-suspension over water courses or unstable slopes.

Seasonal Restrictions (See Table 3 for a summary of seasonal restrictions).

- § Felling and yarding operations would be restricted during the peak bark-slip period (generally May 1 to July 15) if excessive leave tree damage occurs. Western hemlock and true firs are particularly prone to damage.

Coarse Woody Debris (Snags and Down Wood)

- § Retain green trees that have significant defect such as cavities or dead, forked or broken tops.
- § Conifers greater than the diameter cutting limits that need to be cut to create skyline corridors, skid roads, landing areas, or haul roads, would remain on site for coarse wood enhancement. It is anticipated that a small portion of these felled trees would be removed in order to avoid the creation of operational problems and/or safety hazards.
- § If reserve trees must be topped for operational purposes (e.g. lift or tail trees), both portions of the reserve trees would remain on site to augment snag and down woody debris habitat.
- § Existing coarse woody debris would be retained to the extent possible, and snags that are cut or knocked over during logging would remain on site.

- § Existing snags that are greater than 18" dbh and 20' in height, or snags being actively used by wildlife would be surrounded with two or more leave trees to protect them from logging damage.
- § Create three Douglas-fir snags per acre in Unit 19-5, and two Douglas-fir snags per acre in Unit 29-4, a 20-acre portion in the southeast part of Unit 33-1, and in Unit 34-1 upon the completion of harvest activities. Trees used for snag creation should be greater than or equal to the post-harvest quadratic mean dbh of the units; treated trees would not include the largest trees in any given area.

Water, Fisheries and Soil Resources

- § Sanitary facilities would be required for workers in the portions of section 29 that are upstream from the City of Hillsboro reservoir on the Tualatin River at Haines Falls in section 20.
- § The City of Hillsboro would be notified prior to any ground-disturbing activities upstream from the reservoir at Haines Falls.
- § A “no-harvest” buffer would be placed along both sides of streams. The minimum size of this buffer would be 60 feet for non-fish bearing streams and 100 feet for fish bearing streams or to the outer extent of any unstable areas, whichever is greater.
- § To protect water quality, trees would be felled away from all no-harvest buffers within the harvest area. If a cut tree falls into a no-harvest buffer, the portion of the tree within the buffer would remain in place.

Seasonal Restrictions (See Table 3 for a summary of seasonal restrictions)

- § *Yarding and Hauling:* Yarding and hauling would be restricted to periods of low soil moisture, generally June 1 through October 15. This season could be adjusted if unseasonable conditions occur (e.g., an extended dry or wet season). Operations would be suspended during periods of heavy precipitation if resource damage would occur.
- § *Road Work:* All road decommissioning, construction, renovation and maintenance would occur during the dry season (generally June 1 through October 15). All work required in live streams (culvert replacement or removal) would be limited to the ODFW instream work window (July 1 to September 30).

Yarding

- § *Ground:* Designated skid trails would be used in order to limit the extent of skid trails and landings to less than 10% of each harvest unit. Skid trail and landing cutting limits would be kept to the narrowest width and size necessary to reasonably harvest the unit (for analysis purposes, assume a 12-foot-wide skid trail spaced on average 150 feet apart and a 50-foot diameter impact area for landings). Existing skid trails and landings would be used to the extent possible.
- § Yarding logs or construction of skid trails through depressions with very moist, poorly drained sites would be avoided where practical.
- § The purchaser may elect to use mechanized, cut-to-length systems provided that the following measures are met:
 - Harvesters, feller-bunchers, and or log processors would be boom mounted with a minimum operating radius of 20 feet. The equipment would have a ground pressure rating of 8 psi (pounds per square inch) or less. Log harvesting equipment trails would be spaced 40 to 50 feet apart and be no more than 15 feet in width. No more than two passes over the same ground would be permitted.
 - Forwarding or skidding equipment would be restricted to designated trails approved by the Authorized Officer prior to felling and yarding operations. Trails would average 12 feet or less in width and would be located, on average, 100 feet apart.
 - The harvester would be required to place slash in front of the machine tracks or tires in order to reduce compaction. The forwarder or skidder would operate on a nearly

continuous layer of slash that is at least 6 inches thick.

- § Full log suspension would be used to protect identified fragile sites. Where skyline yarding corridors are needed across stream channels, full log suspension would be required within 25 feet of those streams. Full log suspension would be employed on potentially erosive or unstable sites, e.g. generally on slopes exceeding 70 percent. At least one-end suspension of logs would be required in all other cable and ground-based logging areas.
- § Skyline corridors would generally not exceed 12 feet in width and would be located at least 150 feet apart at one end.
- § Riparian no-harvest buffers may have yarding corridors cut through them if necessary; however any trees cut in the no-harvest buffers would be left on site to augment CWD.
- § Ground-based equipment would not be permitted to enter Riparian Reserves except where it is able to operate from existing roads or skid trails.
- § Skyline yarding would be restricted in Riparian Reserves to corridors that are perpendicular to streams, or as close to perpendicular as possible.

Road, Skid Trail and Landing Construction, Reconstruction and Decommissioning

- § New roads and skid trails: New roads and skid trails would generally be located outside of Riparian Reserves. Except for small areas of spot-rocking, rock would not be placed on new roads.
- § Landings: The number of landings and their size would be kept to the minimum required to reasonably harvest the units. Landings would be located by the purchaser and approved by the BLM.
- § Decommissioned roads: All of the newly constructed and renovated roads, as well as some other existing roads, would be decommissioned. Decommissioning would consist of removing culverts, decompacting, water barring, seeding or planting with native species, and restricting OHV use. Restricting OHV use may include the strategic placement of boulders, logs, root wads, or other types of earthen barriers.
- § Skid trails that could easily accessed by OHVs would be blocked by the strategic placement of boulders, logs, root wads, or other types of earthen barriers.
- § Primary skid trails: Where determined necessary and appropriate by the silviculturist and soil scientist, some of the primary skid trails may be decompacted by subsoiling. This determination would be made upon completion of timber harvest.
- § Subsoiled roads and landings would be planted with native tree or grass species.

Special Status Species

- § No potentially suitable murrelet or northern spotted owl nest trees would be felled and where possible, no openings greater than ¼ acre would be created within one site-potential tree height surrounding a potential murrelet nest tree.
- § Any newly discovered marbled murrelet sites (as per the Pacific Seabird Group Marbled Murrelet Technical Committee protocol) would be protected by a 0.5 mile radius buffer on all contiguous existing and recruitment federal habitat.
- § There is at least one area adjacent to a proposed Density Management treatment unit (unit 33-1) on BLM land which contains a single, large second-growth Douglas-fir (69 inch DBH) with potential murrelet nesting structure(s). This tree would be managed in compliance with option 3 the March 26, 2004 policy by the Level 2 Team for the North Coast Planning Province. All habitat modifications that occur within a distance equal to one site-potential tree height of this tree would be designed to protect and improve future habitat conditions. This would include a no-cut buffer at least 60 feet around this tree to assure protection of the roots and crown. The thinning prescription beyond the no-cut buffer would not vary from that of the rest of the unit, other than assuring the retention of the larger, dominant trees within the thinning unit out to the distance of one site-potential tree. Thinning this area would aid limb development of the retained trees and the development of adjacent cover.

Invasive / Non-Native Plants

§ Prior to entering the sale area each work season, or before returning to the watershed after leaving it, any heavy machinery (with the exception of log trucks and pick-up trucks used for daily personnel travel) would have all dirt and adhering vegetation removed by power-washing.

Cultural Resources

§ Survey techniques for cultural resources are based on those described in the *Protocol for Managing Cultural Resources of Lands Administered by the Bureau of Land Management in Oregon* (BLM, 1998). A post-project survey would be conducted according to standards based on slope defined in the Protocol appendix. If cultural material is discovered during project implementation, work would be suspended until an archaeologist can assess the significance of the discovery.

Fuels Management, Fire Risk and Air Quality

§ Prescribed broadcast burning, swamper burning, hand/mechanical pile construction and burning, and landing pile construction and burning may be used individually or in combination in areas where fuel loading is heavy or the fire risk is determined to be high.

§ Burning would be conducted in accordance with the *Oregon State Implementation Plan* and *Oregon Smoke Management Plan* and would comply with the provisions of the Clean Air Act. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in designated areas.

§ Prior to prescribed broadcast burning, firelines would be constructed and slash would be pulled back from thin-barked reserve trees.

§ Swamper burning piles or hand/mechanical piles would be located at least ten (10) feet from green trees, where possible, to minimize damage.

§ Landing piles would be located as far as possible from reserved trees to minimize damage.

§ Lopping and scattering of fuels may be incorporated in areas where fuel loading is relatively heavy but not heavy enough to warrant burning.

§ Pullback of fuels may be incorporated in areas where fuel loading is relatively light (especially along roads and property lines) and not heavy enough to warrant burning.

Table 3 – Seasonal Restrictions Incorporated into the Density Management Project

***Restricted Times are Shaded**

Activity	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15
Falling and Bucking**																								
Ground-Based Yarding																								
Cable Yarding																								
Road Construction, Renovation and Decommissioning																								
Log Hauling																								

* All dates are dependent on actual weather conditions ** Bark slip restrictions may be conditionally waived

2.2.4 Alternatives Considered and Not Further Analyzed

Reduced New Road Construction Alternative

In response to concerns expressed by the public that recent accelerated harvest levels and road construction on private lands in the Roaring Creek area may be having adverse impacts on water quality and fisheries resources, an alternative was considered that would minimize new road construction. By eliminating any new roads over approximately 1,000 feet in length, this alternative would have reduced new road construction to 0.6 miles. Changes in roads necessitated a change in logging systems in order to treat the stands that would no longer be accessible by roads, and it was determined that 572 acres of these stands in the project area would need to be logged by helicopter or dropped from the project. A subsequent analysis determined that the 4.0 miles of new roads proposed in the Proposed Action would not affect water quality or fisheries resources because they are all on the tops of ridges, they are all temporary roads that would be decommissioned when the project ends, they would only be in use during the dry season, there are no new stream crossings, and they are far enough from streams that there would be no increase in sediment into any streams. For these reasons, it was determined that there was no difference in environmental effects to water or fisheries resources between the Proposed Action and the “Reduced New Road Construction” alternative as a result of the reduction in new road construction, and therefore this alternative was not further analyzed.

2.3 Affected Environment and Environmental Effects

2.3.1 Forest Vegetation

2.3.1.1 Affected Environment

The areas proposed for variable-density thinning treatment consist primarily of relatively dense, single-storied 36- to 75-year-old Douglas-fir-dominated stands. The Douglas-fir species composition ranges from 81 to 100% among the proposed treatment units. The spatial distribution pattern of the trees in units is typically uniform. Some stands or portions of stands contain a component of hardwoods (primarily red alder and bigleaf maple) and other conifers (primarily western hemlock, grand fir, and western redcedar). Some stands also contain occasional large legacy conifer trees, some of which are old-growth Douglas-fir. The estimated number of conifer trees per acre greater than or equal to 30 inches dbh ranges from 0 to 6.0.

Except where laminated root rot has created various-sized openings or areas of lower density, most of the proposed treatment areas have relatively dense overstory canopies, which limit the amount of light reaching the forest floor, and therefore, understory development. The density of the stands is at or above the levels recommended when managing for structural complexity and species diversity (Chan et al. 2006). In addition, 69% of the stands are above the density level where mortality from tree-to tree competition occurs. The estimated canopy cover ranges from 65 to 86% among the units, with the lower values generally being a result of openings associated with pockets of laminated root rot. Where there is sufficient light reaching the forest floor, the most abundant understory species include vine maple, salal, dwarf Oregon grape, swordfern, red huckleberry, oceanspray, California hazel, Oregon oxalis, rose, and bracken fern. There is, however, variation in the abundance and composition of understory species among and within the units. Hardwoods, particularly red alder, are common along streams and other seasonally wet areas.

Laminated root rot, caused by the fungus *Phellinus weiri*, is widespread throughout the project area. *P. weiri*, is a native root pathogen that is a natural part of many forest ecosystems (Thies and Sturrock 1995). The average level of infection is estimated to be 20% or more, with the level of

infection ranging from 0 to 47% among the proposed treatment units. Disease centers occur throughout the units in well-defined discrete pockets as well as in a diffuse pattern where groups of one to several trees are affected throughout the infested area. Douglas-fir and grand fir are highly susceptible to *P. weiri*, (they are readily infected and killed by it); western hemlock is intermediately susceptible; western redcedar is tolerant or resistant; and all hardwoods are immune (Hadfield et al. 1986). Because the disease decays their root systems, it kills trees directly by depriving them of water and nutrients, or makes them prone to windthrow by undermining their structural integrity (Thies 1984). The disease spreads through root contacts with infected trees or stumps. Disease centers are believed to expand radially at the rate of about one foot per year (Nelson and Hartman 1975), and the number of trees impacted by the disease can generally be expected to double about every 15 years (Hadfield 1985; Nelson et al. 1981). *P. weiri* attacks susceptible hosts regardless of tree size, age, or vigor.

Tree killing by *P. weiri* can also create openings in the canopy where shrubs, hardwoods, or shade- and disease-tolerant conifer species may occupy these various-sized gaps (Thies and Sturrock 1995). In Units 25-2, 29-1, 29-3, 31-1, 31-2, 33-1 (western portion), and 35-1, root disease centers typically have low conifer stocking and the openings created as trees are killed have filled in, and are continuing to fill, in with shrubs, especially vine maple and salal. The shrub layer in these disease centers is generally quite thick. Hardwood or less-susceptible conifers trees or regeneration of these species is generally lacking. In other areas, especially in Units 33-1 (eastern portion) and 34-1, disease centers are filling in with a combination of less-susceptible conifers (mostly western redcedar and western hemlock) or hardwoods (mostly bigleaf maple and red alder). Disease centers are highly variable in size, ranging from approximately $\frac{1}{4}$ -acre to 9 acres. They are also highly variable in shape. The southern portion of Unit 25-2 contains some particularly severe and extensive *P. weiri* infection centers.

The average total coarse wood volume (includes down wood and snags) among the proposed treatment units is 1,880 cubic feet per acre, which is near the upper end of the moderate range (1,100 to 1,980 cubic feet per acre for Oregon Coast Range stands 25 to 49 years old and for stands 50 to 79 years old), as shown in Table 24 of the Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area (USDA Forest Service and USDI Bureau of Land Management 1998). Approximately 88% of the total coarse wood volume is from down wood, and 12% is from snags. The majority (60% on the average) of the total coarse wood volume occurs in the more advanced decay classes. There is considerable variation in the amount of down wood, snags, and total coarse wood volume among the units. About 35% of the down wood volume is in decay classes 1, 2, and 3, and about 65% is in decay classes 4 and 5. The source of the more recent decay class down wood seems to be smaller trees that have died as a result of suppression or have been windthrown as a result of *P. weiri* root rot infection. The total average down wood volume is 1,660 cubic feet per acre. There is an average of nearly 4.5 conifer snags per acre that average about 19.6 inches dbh and about 59 feet in height. Approximately 74% of the snag volume is in decay classes 1, 2, and 3 and about 26% of the snag volume is in decay classes 4 and 5. The total weighted average snag volume is 220 cubic feet per acre. In addition, there is an average of just over 2.4 broken-topped living trees per acre that average about 14.5 inches dbh. Many of these trees may likely become snags in the near future. The estimated volume of broken-topped trees is 73 cubic feet per acre.

The affected environment for forest vegetation is described in further detail in the silvicultural prescription for the Roaring Creek project area (Project Record Document 17).

2.3.1.2 Environmental Effects Alternative 1: No Action

In the absence of thinning or some other form of canopy disturbance, projections for the relatively healthy portions of the stands (areas not severely infested with *P. weiri* root disease) are for the

density levels of the stands to generally increase to fairly high levels over the next 25 years. The progression toward late-successional forest conditions is expected to continue to slow as the stands become increasingly dense and uniform. As the level of competition among the trees remains high, crown development (live crown ratio, crown expansion, and branch growth) would decrease, diameter growth rate can be expected to decline, and competition-related mortality would increase resulting in coarse wood additions mainly from the smaller-diameter trees that slowly die from suppression. Understory development would also be limited. Any conifers which may exist in the understory of some stands can be expected to decline in vigor and exhibit a very slow growth rate, with some possibly falling out of the stands because they are no longer able to survive under the increasingly dense overstory shade. A declining trend in the hardwood component can be expected in the future as they are out-competed (overtopped) by the conifers. In addition, the trees are expected to become less stable, and therefore, more likely to be windthrown or break off in severe winter storms, as they put a higher proportion of their growth into height growth vs. diameter growth under the influence of increasing tree-to-tree competition.

In centers of *P. weiri* root disease infection where tree species that are less-susceptible this disease (species other than Douglas-fir and grand fir) are not filling as trees are killed by the disease, centers are expected to expand resulting in further decreases in conifer stocking and enlargement of the shrub-dominated openings. The developmental trajectory for the majority of these root disease infection centers appears to be shrub-dominated openings containing short-term snags and down logs. The shrub density in many of these disease centers precludes establishment and growth of understory trees. Fresh down Douglas-fir trees also encourage the build-up of Douglas-fir beetle populations, which subsequently attack and kill additional Douglas-fir trees, especially those trees already weakened by disease (Hadfield 1985). Therefore, these root disease centers do not appear to be developing older-forest characteristics and have a greatly diminishing timber production capability as well. Disease centers where less-susceptible conifers (primarily western redcedar) and hardwoods (primarily bigleaf maple and red alder) are filling in as Douglas-fir and grand fir are killed would continue to diversify the structure and species composition in these areas as well as reduce disease spread.

The environment effects for Alternative 1: No Action on forest vegetation are described in further detail in the silvicultural prescription for the Roaring Creek project area (Project Record Document 17).

2.3.1.3 Environmental Effects Alternative 2: The Proposed Action

The proposed variable-density thinning treatments are expected to redirect the current stand developmental trajectory away from increased uniformity and towards a more complex structure characteristic of older forests while minimizing short-term effects on habitat quality. As a result of implementing this prescription, the density within and among units would vary. Within units, the density would be varied 25% above and 25% below the average at the scale of approximately one-half acre. Therefore, some trees would be given more room to grow and others would be given less. This should increase overstory canopy heterogeneity and result in a more uneven pattern of understory development as well. Specific areas (special *P. weiri* treatment areas) within units 29-1, 29-3, 31-1, 31-2, 33-1, and 35-1 that vary from about ¼ to 9 acres in size and are heavily infested with *P. weiri* root disease where natural filling in of disease-caused openings with less susceptible conifers or hardwoods is not occurring, are proposed to be treated separately from the remainder of the units because of the disease infestation. Outside of these special *P. weiri* treatment areas (including 47% of Unit 25-2), the residual number of trees per acre and canopy cover among the units is expected to range from about 46 to 107 trees per acre and 52 to 64%, respectively immediately after thinning. Within the special *P. weiri* treatment areas (including 47% of Unit 25-2), the residual number of trees per acre and canopy cover is expected to average about 20 and 31% respectively, immediately after thinning.

In addition, as a result of implementing the proposed variable-density thinning prescription, the average stand diameters are expected to increase; crown ratios, crown widths, and limb development (branch size) of the residual trees should increase; natural regeneration of shade-tolerant conifers should be stimulated in the units with a component of shade-tolerant trees in the overstory; growth of understory trees, shrubs, and herbs should increase; windfirmness and stability of the residual trees should increase; and mortality of the smaller-sized trees should generally decrease over the next 25 years following treatment compared to the untreated stands. By retaining tree species other than Douglas-fir and grand fir and by planting disease-resistant conifers and hardwoods in areas infested with *P. weiri* root rot, the current and future impacts from this disease should be reduced, and the species diversity and structural complexity should be increased. Thinning primarily from the Douglas-fir component to increase the relative proportion of the other species should also increase the general species diversity of the units.

Although the thinning is expected to generally remove the smaller-sized trees that would have likely died from suppression, leaving various-sized areas unthinned (approximately 21% of the original project area) and lighter thinned areas within the units as a result of implementing the variable-density prescription would provide places where competition-related mortality should continue. Considering the anticipated levels of coarse wood following treatment in the near future (within 5 years after treatment) from damage and breakage during felling, windthrow, trees greater than or equal to the diameter limit cut to facilitate logging and left on site, and coarse wood (primarily snag) creation, the overall average quantity of coarse wood is expected to be just over 2,300 cubic feet per acre. This volume of coarse wood is within the lower end of the high range (1,980 to 3,800 cubic feet per acre for Oregon Coast Range stands 25 to 49 years old and 1,980 to 4,840 cubic feet per acre for stands 50 to 79 years old), according to Table 24 of the Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area (USDA Forest Service and USDI Bureau of Land Management 1998). Project implementation is expected to set the stage for future treatments that could continue the progress of the stands towards developing more complex structures.

The environment effects for Alternative 2: the Proposed Action on forest vegetation are described in further detail in the silvicultural prescription for the Roaring Creek project area.

2.3.2 Threatened or Endangered Wildlife Species, Habitat and/or Critical Habitat

Where appropriate, discussions and/or analysis of the affected environment of the Roaring Creek Projects relative to wildlife and wildlife habitat are conducted at several spatial scales. The larger scales include the landscape or watershed scale; a project-specific Wildlife Analysis Area was developed to address an intermediate spatial scale; and finally, the smaller spatial scale discusses species-specific habitat conditions within and/or directly adjacent to the individual treatment units or project areas for each of the three Roaring Creek projects.

Landscape or Watershed Scale

The bulk of the Federal lands that include the proposed Roaring Creek project areas are located within the Scoggins Creek 5th field watershed, within the Upper and Middle Tualatin River 6th field subwatersheds. A small portion of the Density Management treatment area is located within the North Yamhill 5th field watershed, within the Turner Creek 6th field subwatershed. Relative to wildlife resources, the pertinent issues or concerns identified within the *Upper Tualatin-Scoggins Watershed Analysis* (USDI - BLM, February 2000) and the *North Yamhill Watershed Analysis* (USDI - BLM, January 1997) was the likelihood for cumulative effects related to general factors affecting the distribution of sensitive species and habitats. These issues are closely related to ownership patterns and

past management practices resulting in a very high degree of forest fragmentation, relatively small-sized forest patches and the associated limited amount of interior forest habitat. These factors can result in dispersal problems for some species and/or a high degree of regional isolation for some species of concern. Another commonly discussed and related issue within the applicable Watershed Analyses is the general lack of late-seral habitat and/or some late-seral habitat features such as “forest legacies” (e.g. large trees, snags and down logs). While private lands within the northern portion of the Oregon Coast Range containing the proposed project support some dispersal habitat for the northern spotted owl, the suitable habitat for the spotted owl, marbled murrelet and bald eagle on these lands is very limited in quantity and marginal in quality thereby not notably contributing to the viability of the species. For additional information on the wildlife and wildlife habitat within the watersheds, see the Upper Tualatin-Scoggins and North Yamhill Watershed Analyses as well as the North Coast LSRA (*Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area* - USDA and USDI, January 1998).

The North Coast LSRA incorporated the use of Landscape Analysis for lands within the boundary of the Oregon North Coast Adaptive Management Area. As defined within the LSRA, it identifies the Federal lands within the general Roaring Creek project areas, including the areas proposed for various treatments, as being Early-Seral Landscape Cells located within the Buffer Landscape Zone. Lands in this Landscape Cell and Zone contain less than 10% late-successional habitat. Based upon ownership patterns, stands within this Landscape Zone are unlikely to develop into large, contiguous blocks of late-successional habitat, but are considered important to ecosystem function by providing for connectivity, dispersal, and provisions of refugia for species dependent on late-successional habitat characteristics.

The Roaring Creek Wildlife Analysis Area

For the purposes of this analysis, the “Roaring Creek Wildlife Analysis Area” is defined as an aggregated area of land located in portions of four adjacent townships, equal in size to 28 legal sections - approximately 17,850 acres in size (see Figure 4). This Analysis Area was used for a portion of the impact analysis of the Roaring Creek Projects upon wildlife resources (including spotted owl dispersal habitat). The Analysis Area as defined is centered on legal sections containing the proposed Roaring Creek treatment areas. It spans the eastern slopes of the Coast Range Mountains, abutting the open woodlands and agricultural/residential lands on its eastern side and crossing the summit of the Coast Range on its western boundary. Approximately 19.2% of the Analysis Area (3,437 acres) is managed by the BLM, 10.6% (1,890 acres) is managed by ODF (Oregon Department of Forestry), 4.7% (840 acres) municipal, and 65.5 % (11,683 acres) is privately owned – primarily by industrial timber companies with Weyerhaeuser Company being the largest private landowner within the area.

Figure 4. *The Roaring Creek Wildlife Analysis Area* The “Analysis Area” used for portions of the impact analysis of the Roaring Creek Projects upon wildlife resources includes a total of 28 sections of land located in four adjacent townships. Sections containing treatments as proposed within the Roaring Creek EA are shaded.

T1S R6W	-	-	-	-	-	-	-	T1S R5W
-	24	19	20	21	22	23	24	-
-	25	30	29	28	27	26	25	-
-	36	31	32	33	34	35	36	-
-	1	6	5	4	3	2	1	-
T2S R6W	-	-	-	-	-	-	-	T2S R5W

Federal Land Use Allocations within the Analysis Area

All of the 3,437 acres of BLM land within the Roaring Creek Wildlife Analysis Area are within the AMA (Adaptive Management Area) Land Use Allocation. In addition, 542 of these acres are also within the LSR (Late Successional Reserve) LUA (LSR #RO807), and approximately 50% of the Federal ownership is also located within the Riparian Reserve LUA. The acres of LSR are located within two different sections; within section 19 the entire 487 acre block of BLM ownership is allocated as LSR, while in section 3 there are individual stands of forest at the FOI (Forest Operations Inventory) unit scale (27 and 28 acres in size) that are allocated as LSR. Based upon ownership pattern and size of these LSR parcels, they do not lend themselves to the management of species requiring large blocks of late-seral habitat. Rather, these parcels contribute toward general landscape connectivity and function more as refugia for late-successional associated species with smaller home ranges, or habitat for those species which may utilize other habitat types but are dependent upon some specific late-successional habitat features. These Land Use Allocations are identified within the NWFP and Salem District RMP.

Similar Projects within the Wildlife Analysis Area

Approximately 217 acres of other Past, Present or Reasonably Foreseeable Future Federal Projects within the Analysis Area have been identified that could result in similar impacts as expected to result from the Roaring Creek Projects. A total of approximately 217 acres of BLM’s Blind Barney Density Management Project are located within two sections within the Analysis Area.

Less information is available on management activities that have recently occurred or are scheduled to occur on non-Federal lands within the Analysis Area however, the general trend on private land is one of harvest activities which result in decreasing quantities of mid- and late-seral habitat. The majority of the non-Federal forestland within the Analysis Area is privately owned by industrial timber companies and is managed for timber production on relatively short rotations. This effectively results in the private lands being maintained in a continual condition of earlier seral stage habitats and generally precludes the development and/or maintenance of mid- or late-seral habitats. There has been a great deal of recent clearcut harvest operations implemented on non-Federal lands within the Analysis Area, it is estimated that approximately 4490 acres of the non-BLM land have been clearcut harvested within approximately the last 10 years. This represents approximately 25% of all of the lands within the Analysis Area. ODF is currently planning their FY2009 “Drive South” timber sale within the Analysis Area. It is a thinning

operation with approximately 210 acres located within the Analysis Area in section 19 and T.1S, R6W, section 24.

2.3.2.1 Affected Environment

The discussions of the affected environment below address species-specific habitat conditions directly adjacent to and/or within the density management treatment units.

Affected Environment – Species-specific and/or Project Area Scales for the Proposed Density Management Treatment Units

A more detailed description of the affected environment is located in the Forest Vegetation Affected Environment section (2.3.1.1).

There are no known special habitats (e.g., talus slopes, cliffs, caves, or mines or abandoned wooden bridges) within the vicinity of any of the proposed projects.

Wildlife Species Proposed or Listed under the Endangered Species Act:

Northern Spotted Owl - Federally Threatened (FT)

The majority of forest land around the proposed project area is privately owned and managed for timber production in such a way as to preclude the development of larger blocks of late-seral stage habitat including suitable habitat for the spotted owl. The limited amount of Federal land within the area is distributed in a checkerboard fashion and is relatively isolated from larger blocks of Federal ownership; these factors do not facilitate effective management of wide ranging species such as the spotted owl.

Critical Habitat is designated by the US Fish and Wildlife Service (USFWS) to provide for the conservation and eventual recovery of listed species. None of the lands within the Roaring Creek Wildlife Analysis Area including the proposed Roaring Creek Density Management project area are located within or adjacent to spotted owl Designated Critical Habitat (USDI 1992).

Dispersal Habitat Conditions within the Analysis Area

Generally, spotted owls use dispersal habitat to move between blocks of suitable habitat, roost, forage and survive until they can establish a nest territory. Although nesting might occur in dispersal habitat, dispersal habitat generally lacks the optimal structural characteristics needed for nesting. Spotted owl suitable habitat also functions as dispersal habitat.

Currently, it is believed that the Roaring Creek Analysis Area contains an adequate amount of habitat in a condition to facilitate spotted owl movements through the area. Based upon a GIS sort of BLM's FOI database, Roaring Creek Stand Exam data and knowledge of the area, approximately 2,644 acres of the BLM land within the Analysis Area is currently considered to be spotted owl dispersal habitat; an additional 666 acres is considered to be suitable owl habitat. Therefore, 96.3% of the Federal land within the Analysis Area is in a condition to facilitate spotted owl movements. An estimated 7,073 acres of the non-Federal land within the Analysis Area is currently probable owl dispersal habitat. Considering all ownerships, approximately 61.1% of the forestland within the Analysis Area (10,383 acres) is estimated to be currently in a condition to facilitate spotted owl dispersal.

Some of the dispersal habitat within the Analysis Area, including portions of the proposed density management units, is considered to be of poor quality based upon the young stand age, small crown ratios and the extreme high density of trees which could inhibit an owl's ability to fly through the stand. Some of the conditions that keep these younger, more structurally simple stands from being

considered suitable owl habitat include the lack of vital habitat characteristic such as large green trees and snags especially those containing suitable nesting substrates (e.g. large sheltered platforms or large cavities) and the relatively poor quality of habitat for a suitable prey base, which is primarily the northern flying squirrel in this area. The high degree of general forest fragmentation and relatively small patch sizes of some of the forested stands within the area further limit the habitat quality of much of the dispersal habitat within the Analysis Area.

Spotted Owl Dispersal Habitat within and near Density Management Treatment Units

Aside from the two treatment units which have been determined to contain suitable habitat, all of the units proposed for density management (totaling 802 acres) are considered to be spotted owl dispersal habitat. For the reasons stated above in the general discussion of dispersal habitat within the analysis area, some of the dispersal habitat proposed for density management is considered to be poor quality. Slowing growth rates and decreasing crown ratios of all of the stands proposed for treatment would tend to lengthen the expected time necessary for these stands to develop into suitable habitat, especially higher quality spotted owl habitat.

Spotted Owl Suitable Habitat within the Analysis Area

Based upon a GIS sort of BLM's FOI database, Roaring Creek Stand Exam data and knowledge of the area, there are 666 acres of spotted owl suitable habitat on BLM land within the Analysis Area; this represents 19.3% of the BLM land within the Analysis Area and considering all ownerships, it represents 3.9% of the forestlands within the Analysis Area. The bulk of this spotted owl suitable habitat (approximately 70%) is considered to be very marginal in quality. Reasons for considering this habitat to be of lower quality include the following: relatively small size of the patch of habitat; the young stand age; general lack of large green trees, snags, and/or down logs; relatively simple stand structure and/or the young, fragmented nature of the surrounding landscape.

There is variation in the amount and condition of down wood, snags, and total CWD (Course Woody Debris) volume within the units considered to be suitable spotted habitat however in general, as defined in the North Coast LSRA, there are moderate to high levels of total CWD volume. The vast majority (86-91%) of the existing CWD volume within these units is in the form of down logs rather than snags, and the bulk of the down logs are in the later decay classes (decay classes 3, 4 and 5). The Desired Future Condition, from a habitat perspective, is to have a larger proportion of the total CWD volume in snags than is currently present, and to have the total volume more evenly distributed across all decay classes.

There is very little spotted owl suitable habitat on non-Federal land within the Analysis Area, and for the purposes of this analysis it is considered to be negligible.

Spotted Owl Suitable Habitat within and near Density Management Treatment Units

Within the proposed Density Management units, a total of approximately 104 acres of suitable spotted owl habitat is distributed in two treatment units (19-5 and 34-1) and is considered to be very marginal in quality. This is a largely a result of stand age and resulting general lack of larger trees and snags. Based upon stand exam data, Unit 19-5 is 49-years-old and has a quadratic mean diameter of 18.1 inches, while Unit 34-1 is 75-years-old with a quadratic mean diameter of 18.6 inches. Both of the stands within these treatment units have developed under a relatively low stocking level, which together with favorable site conditions likely account for their QMDs (Quadratic Mean Diameters) being greater than 18 inches and therefore considered to be spotted owl suitable habitat (albeit of low quality) despite their relatively young age. There is variation in the amount and condition of down wood, snags, and total CWD (Course Woody Debris) volume within these units however in general, as defined in the LSRA, there are moderate to high levels of total CWD volume. However, the vast majority (86-91%) of the existing CWD volume is in the

form of down logs rather than snags, and the bulk of the down logs are in the later decay classes (decay classes 3, 4 and 5).

Proximity to Known Spotted Owl Sites

There are no historic or known occupied spotted owl sites, or 100-acre core areas as identified in the NWFP and Salem RMP within the Roaring Creek Wildlife Analysis Area, including near any of the proposed Density Management project areas. The nearest known spotted owl sites considered to be currently occupied are located approximately 6 miles south-west of the project areas, with another located approximately 7 miles to the north. The most recent, available occupancy data (BLM unpublished data and Laurie O'Nion, ODF biologist – personal communication) at both of these sites suggests they were each occupied by a single spotted owl. None of the proposed harvest units or haul routes are located within or near a spotted owl RPA (Reserve Pair Area) as delineated within the document entitled *Delineation and Management of Reserve Pair Areas within Oregon's Northern Coast Range Adaptive Management Area* (BLM, 2000).

Spotted Owl Surveys

Based largely upon the region-wide scale of conservation incorporated into the NWFP and Salem District RMP including an extensive reserve network throughout the range of the northern spotted owl, there currently are no NWFP or RMP requirements to survey for spotted owls. However, thinning operations within suitable spotted owl habitat within the LSR LUA may only be addressed within the current programmatic ESA consultation if they have been surveyed to protocol and determined to be unoccupied by spotted owls.

Therefore, in cooperation with the Oregon Department of Forestry, spotted owl protocol surveys are scheduled to be conducted during the 2007 and 2008 survey seasons within and/or near all of BLM's LSR parcels which contain stands determined to be suitable spotted owl habitat and that are proposed for Density Management treatment. Density Management Treatment Unit 19-5 (36 acres) is the only treatment unit determined to contain suitable habitat within the LSR LUA although in order to fulfill protocol, surveys would be conducted throughout a much larger area including other treatment units, most notably those in section 29. Approximately half of the spotted owl suitable habitat within the Analysis Area (section 19), is scheduled to be surveyed during the 2007 and 2008 survey seasons.

Marbled Murrelet - (FT)

The Roaring Creek Projects are located on the eastern slopes of the Coast Range Mountains. Ranging from approximately 29 to 35 miles from the ocean, the Roaring Creek Density Management project areas are located within the outer portion of marbled murrelet Zone 1. In Oregon, Zone 1 is located in a band of land extending up to 35 miles inland and Zone 2 is located 35 to 50 miles from the sea; Zone 1 holds a higher likelihood for murrelet occupancy than Zone 2.

Designated Critical Habitat

Critical Habitat is designated by USFWS to provide for the conservation and eventual recovery of listed species. A total of approximately 73.8 acres of the Density Management treatment units within sections 3 and 19 are located within a Marbled Murrelet Designated Critical Habitat Unit (CHU # OR-02-e) (USDI 1996).

Proximity to Known Murrelet Sites

With the nearest known marbled murrelet site being located approximately 14 miles to the southwest of the Roaring Creek project areas, there are no known occupied murrelet sites within the vicinity of the proposed Density Management units or haul routes.

Suitable Murrelet Habitat Within the Analysis Area

A total of approximately 100 acres within the Roaring Wildlife Analysis Area has been determined to be marbled murrelet suitable habitat; these acres contain scattered individual and clumps of remnant old-growth trees which often contain numerous platforms that appear to be potentially suitable as murrelet nesting structure(s). These acres are all located on BLM land and are located in two distinct patches; one patch is about 94 acres in size and located in section 19 and the remaining patch is approximately 6 acres in size and located in the of section 3.

There is at least one area adjacent to a proposed Density Management treatment unit (unit 33-1) within the Analysis Area located on BLM land which contains a single, large second-growth Douglas-fir (69 inch DBH) with potential murrelet nesting structure(s). It is located along the northern property line of section 33 near the headwater area of a Riparian Reserve. This tree would be managed in compliance with option 3 of the March 26, 2004 policy by the North Coast Province Interagency Level 2 Team. As per option 3 of this policy, no murrelet protocol surveys are required or scheduled to be conducted near this single tree containing potential murrelet nesting structure(s). All habitat modifications that would occur within a distance equal to one site-potential tree height of this tree would be designed to protect and improve future habitat conditions.

There are no identified stands of marbled murrelet suitable habitat on non-Federal land within the Roaring Creek Wildlife Analysis Area. It is possible that a few additional unidentified, single trees containing potential murrelet nesting structure(s) are located within the Analysis Area, although none are suspected to occur within or adjacent to any of the Roaring Creek treatment units.

Murrelet Habitat and Surveys within and near the proposed treatment units

There is no marbled murrelet suitable habitat, or identified individual trees containing potential murrelet nesting structure(s) within any of the proposed Roaring Creek Density Management treatment units. However Density Management treatment units 19-1, 19-4, a small portion of 19-5, and 34-1 are located directly adjacent to the patches of marbled murrelet suitable habitat discussed above. In compliance with option 1 of the policy by the North Coast Province Interagency Level 2 Team, marbled murrelet protocol surveys are scheduled to be conducted within these stands of suitable habitat during the 2007 and 2008 survey seasons.

Bald Eagle - (FT)

Bald Eagle Habitat Conditions within the Roaring Creek Wildlife Analysis Area

Bald eagles generally nest and/or roost within conifer-dominated habitat generally 80-years-old or older, or younger stands containing scattered groups or individual residual old-growth or larger second-growth trees, located within one mile of a large major river or lake, or within 0.5 mile of a major tributary. Within the Roaring Creek Wildlife Analysis Area, a major river is considered to be 6th order or larger; there are no “major rivers” within or near the Roaring Creek Analysis Area. A “major tributary” is considered to be a 5th order stream; that portion of the Tualatin River that passes through the Wildlife Analysis Area is considered to be a 5th order stream and therefore a “major tributary” potentially influencing habitat suitability for bald eagles.

There are a total of 239 acres of suitable bald eagle habitat within the Wildlife Analysis Area; all of this habitat is on BLM land (sections 19 and 29). It includes forested stands greater than 80-years-old or stands containing scattered groups or individual residual old-growth and/or larger second-growth trees. It is located within 0.5 miles of an identified “major tributary”, the middle Tualatin River. The identified suitable bald eagle habitat discussed above contains an abundant number of large trees with potential to serve as eagle nest trees, although it is probably best suited for roosting and resting rather than nesting. This is based upon the fact that coho salmon and Willamette steelhead trout runs within the various river systems are quite depressed and there is a natural

barrier to anadromous fish passage about a mile downstream from these stands of suitable habitat, thereby limiting the availability of potential forage; cutthroat trout populations within the area are healthy. Neither eagle nests nor eagle usage have been observed in these patches of suitable eagle habitat, however dispersed eagle usage would most probably occur during the late fall or winter months.

Less information is available on habitat conditions on non-Federal lands, however the general trend on private land within the Analysis Area or across the larger landscape is one of decreasing quantities of mid- and late-seral habitat. It is possible that a limited number of unidentified scattered individual trees or small groups of trees which are suitable to eagles for roosting or resting may be located within the Analysis Area near some of the treatment units or along portions of the various haul routes.

Bald Eagle Habitat Conditions within and near the Roaring Creek Density Management Treatment Units

There is a total of 47 acres of suitable bald eagle habitat within one of the proposed Roaring Creek Density Management treatment units (29-2); this represents 20% of the identified eagle habitat within the Analysis Area. All of the remaining identified eagle habitat within the Analysis Area (192 acres) is within a 0.25 miles or 0.5 mile line-of-sight of a proposed Density Management treatment unit.

Proximity to Known Eagle Sites

There are no known bald eagle communal winter roosts within the Analysis Area including in the vicinity of the proposed Density Management project areas. The nearest known bald eagle nest is near Henry Hagg Lake, approximately 3.5 miles northeast of the closest proposed density management treatment unit. Because of the high visibility of bald eagles and bald eagle nests, it is unlikely that projects would be located in areas with undiscovered bald eagle nests or roosts.

2.3.2.2 Environmental Effects Alternative 1: No Action

Under the No Action Alternative, the identified adverse and/or beneficial impacts of the action alternative upon wildlife and wildlife habitat would not occur at this site at this time. The local plant and animal communities would be dependent upon and respond to ecological processes that would continue to occur based on the existing condition without management intervention. Relative to the Action Alternative, slowing growth rates and decreasing crown rations of all of the stands proposed for treatment would tend to lengthen the expected time necessary for these stands to develop into late-seral habitat, especially multi-storied, higher quality habitat.

There are no identified cumulative impacts to wildlife resources associated with the No Action Alternative. Selection of the “No Action” Alternative would be of *NO EFFECT* upon the marbled murrelet and spotted owl (and their critical habitat) as well as the bald eagle and all other species listed under the ESA.

2.3.2.3 Environmental Effects Alternative 2: The Proposed Action

Northern Spotted Owl - (FT) *Designated Critical Habitat*

The proposed Roaring Creek Density Management project would not occur within or near spotted owl Designated Critical Habitat therefore, the proposed project would be of *NO EFFECT* upon spotted owl Designated Critical Habitat.

Impacts to Known Spotted Owl Sites

There are no historic or known occupied spotted owl sites, 100-acre core areas as identified in the NWFP and Salem RMP or spotted owl RPAs (Reserve Pair Areas) within the Roaring Creek Wildlife Analysis Area, including within or near any of the proposed Density Management project areas. No impacts to any currently known spotted owl sites would be expected to result from implementation of the Roaring Creek Density Management Project.

Spotted Owl Surveys

In cooperation with the Oregon Department of Forestry, spotted owl protocol surveys are scheduled to be conducted during the 2007 and 2008 survey seasons within and/or near all of BLM's LSR parcels which contain stands determined to be suitable spotted owl habitat and that are proposed for Density Management treatment.

Note: Should these owl surveys result in the identification of an occupied spotted owl site within the vicinity of the proposed treatments, the project would either be modified to meet the standards of the appropriate programmatic consultation; a project-specific ESA consultation would be initiated with USFWS to address the impacts resulting from the project as planned; and/or based upon the site-specific situation, discussions would be initiated with the North Coast Planning Province Interagency Level 1 Team (including USFWS) to assure compliance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended. This "new information" would be documented and addressed in the Final Decision documentation for the Roaring Creek Projects.

Potential Effects to Spotted Owls due to Disturbance

Proposed actions that generate noise above local ambient levels may disturb northern spotted owls and interfere with essential foraging or nesting behaviors. Noise has been shown to disrupt other birds causing reduced fitness and even death. Although adult birds can move away from a noise source, nesting adults moving away from disturbance could cause increased predation to young or missed feedings, which could result in a reduce fitness of the young and even death.

Although many of the harvest operations and/or associated activities (e.g. yarding, hauling, culvert replacement or removal) would be scheduled to occur late in spotted owl breeding season, certain activities if requested by the purchaser would be allowed earlier in the year, within the spotted owl critical breeding season. Some of these utilize heavy equipment or chainsaws thereby generating noise above the ambient level and would occur within 0.25 miles of approximately 200 acres of unsurveyed spotted owl suitable habitat located in sections 31, 33, 34 and 3.

Proposed disruptions within or near suitable habitat with no history of an owl nest site or activity center have the potential to occur within the disruption distance of an active nest site during the breeding season, however the potential likelihood of impacts is considerably less than operations occurring within the vicinity of a known nesting pair of spotted owls. Therefore, potential disturbance resulting from implementation of the Roaring Creek Density Management Project *MAY AFFECT but is NOT LIKELY TO ADVERSELY AFFECT* spotted owls.

Impacts due to Modification of Spotted Owl Habitat

The Roaring Creek Density Management Project proposes to treat a total of 906 acres. Approximately 104 of these acres are considered to be suitable habitat for the spotted owl and 802 acres are considered to be spotted owl dispersal habitat. A large portion of these treated acres,

would be degraded for a period of approximately 10 to 20 years. The crowns of the retained trees are expected to rapidly expand and the growth rates increase as a result of the thinning treatments. The short-term negative impacts resulting in this “degraded” habitat condition would be expected to gradually ameliorate over time as the treated stands continue to develop.

Impacts to Spotted Owl Suitable Habitat

A total of approximately 104 acres of suitable spotted owl habitat, distributed in two treatment units is proposed for density management. Post-harvest, these acres would be expected to continue to function as spotted owl suitable habitat; this is based primarily upon the fact that the average post-harvest canopy closure is expected to be greater than 60%.

Largely a result of stand age and resulting general lack of larger trees and snags, the suitable owl habitat within both of these units is considered to currently be very marginal in quality.

Snag creation in the units would augment the existing snag levels and/or help offset some of the potential short- or longer-term adverse impacts to the CWD habitat features within these stands of suitable owl habitat resulting from the thinning.

Impacts to Spotted Owl Dispersal Habitat

Post-harvest, those acres treated with a density management operation would be expected to continue to function as spotted owl dispersal habitat; this is based largely upon the fact that the average post-harvest canopy closure within the treated stands is expected to be greater than 40%. Taking into consideration that existing pockets of *P. weiri* root disease within some of these stands would be thinned much heavier than the surrounding stand, those acres treated with the density management treatments are expected to have a post-treatment average canopy closure ranging from an estimated 49% to 64%. Treated pockets of *P. weiri* root disease are not expected to act as barriers to owl dispersal but rather as contributing elements to the diverse “clumpy-gappy” distribution of the retained trees within the treatment unit as a whole. In the longer-term, planting of treated root rot pockets with disease resistant species would further promote the development of late-seral habitat structure.

In addition to the identified short-term adverse impacts, some beneficial impacts to those acres treated with the density management operation would also be expected. Some of the dispersal habitat within the proposed density management units is currently considered poor quality dispersal habitat based upon the young stand age, small crown ratios and the extreme high density of trees which could inhibit an owl’s ability to fly through the stand. Removing a portion of the trees from those stands or portions of the stands currently with a very high density of trees may actually have some immediate beneficial impacts to some elements of the current habitat quality. The design features of the Density Management Project for units 29-4 and a portion of 33-1 include the creation of snags. The project would create 2 snags per acre (a total of approximately 60 snags) within 30 acres of dispersal habitat treated by the Density Management Project; snag creation would focus on stands or portions of stands with generally lacking *P. weiri* root disease. This would augment the existing snag levels and/or help offset some of the potential short- or longer-term adverse impacts to the CWD habitat features within these stands of dispersal owl habitat resulting from the thinning.

In the long-term, the proposed thinning is expected to result in increased or maintained growth rates of the trees retained within the overstory. Where present, understory conifer and/or shrub species would also benefit for decreased competition. This would result in the development of some features of spotted owl suitable habitat within these stands currently considered to be dispersal habitat earlier than would occur without treatment. These features include large trees within the overstory which would be potential sources of future snags and down logs, and generally a more diverse and/or complex vertical and horizontal stand structure.

Cumulative Impacts to Spotted Owl Habitat

There are no identified cumulative impacts to spotted owl suitable habitat as a result of the Roaring Creek Density Management Project.

In general, considering the current habitat conditions within the Analysis Area, the impacts of the Roaring Creek project and other identified BLM and ODF thinning projects as well as the expected trends on private lands, there would be no identified adverse cumulative impacts to spotted owl dispersal as a result of the Roaring Creek Density Management Project.

There appears to be a very reasonable likelihood that a minimum of approximately 1,000 acres of the existing private industrial dispersal habitat within the Analysis Area would be removed in the near future – most likely within the next eight to ten years. This represents approximately 9.6% of the existing habitat currently in a condition to facilitate owl dispersal or approximately 5.5% of the forestland within the Analysis Area. There are no regeneration (clearcut) harvest operations scheduled to occur on BLM or ODF land. An unknown quantity of younger plantations currently in a condition of spotted owl “non-habitat” would mature into dispersal habitat during this same time period but these acres are assumed to be negligible.

This would result in a maximum amount of approximately 9,383 acres of dispersal or suitable habitat to be expected to be remaining within the Analysis Area – considering all ownerships this represents approximately 55.2% of the forestlands within the Analysis Area. Considering BLM’s Roaring Creek and Blind Barney Density Management Projects as well as ODF’s Drive South Timber sale, approximately 14.2 % of these acres (1,333 acres) would be capable of functioning as dispersal habitat although they would be in a “degraded” condition as result of a recent thinning treatment. While the effects of the thinning operation may linger for decades, these effects would generally ameliorate over time as the stands continue to develop. Thinned stands would be expected to ultimately provide better habitat structure in the long-term than would occur without treatment. Considering the facts that approximately 55.2% of the forestlands within the Analysis Area would be in a condition to facilitate owl dispersal post-treatment and that approximately 14.2% of this habitat would have been recently thinned, it is believed that the Roaring Creek Analysis Area would contain an adequate amount of habitat in a condition to facilitate spotted owl movements through the area after the proposed treatments have occurred.

Impacts of to the Spotted Owl as a result of Habitat Modification

Alternative 2 of the Roaring Creek Density Management Project *MAY AFFECT* but is *NOT LIKELY TO ADVERSELY AFFECT* the spotted owl as a result of habitat modification. This is based upon the identified beneficial and adverse impacts discussed above resulting from Density Management treatments. Post-treatment, all of the acres currently considered to be suitable habitat would be expected to continue to function as spotted owl suitable habitat and similarly, the current dispersal habitat would be expected to function as owl dispersal habitat post-treatment.

Marbled Murrelet - (FT)

Impacts to Designated Critical Habitat

The Roaring Creek Density Management treatment units which are located within Designated Critical Habitat do not contain any trees with potential murrelet nesting platforms. However, they all are located within 0.5 miles and contiguous with stands containing potentially suitable marbled murrelet nest trees. Forested stands within 0.5 mile of trees with potential nesting platforms (with a canopy height of at least one-half the site-potential tree height) would be treated by the density

management project; it is estimated that the canopy closure of these thinned stands would be reduced to approximately 49-67%.

No potentially suitable murrelet nest trees would be felled as a part of the Roaring Creek Density Management project and no openings would be created within one tree length surrounding a potential murrelet nest tree.

Although protection measures have included in the design of the project, implementation of the Roaring Creek Density Management Project *MAY AFFECT* but is *NOT LIKELY TO ADVERSELY AFFECT* Designated Critical Habitat for the marbled murrelet based upon the potential for beneficial and/or adverse impacts to primary constituent elements of murrelet Designated Critical Habitat.

Suitable Murrelet Habitat and Potential for Disturbance

Based upon the fact that all of the known marbled murrelet suitable habitat within 0.25 miles of the proposed treatment units (sections 19 and 3) would be surveyed to protocol and found to unoccupied, there is little likelihood for disturbance impacts to murrelets. Disturbance from proposed actions conducted within the disruption distance (100 yards) of the single tree with potential murrelet nesting structure(s) between April 1 and August 5 (discussed above) located in section 33, *MAY AFFECT*, but is *NOT LIKELY TO ADVERSELY AFFECT*, murrelets based upon the potential for disturbance.

Note: Should the scheduled murrelet surveys result in the identification of an occupied murrelet site within the vicinity of the proposed treatments, the project would be modified to meet the standards and guides of the NWFP and Salem District RMP. This would include protecting all contiguous existing and recruitment habitat for marbled murrelets (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years) within a one-half mile radius of any site where the birds' behavior indicates occupation; this could including a change in the Land Use Allocation to (unmapped) LSR as appropriate. This "new information" would be documented and addressed in the Final Decision documentation for the Roaring Creek Projects. If necessary, interagency Level I Team (terrestrial sub-group) for the North Coast Province - including USFWS, would be informed to assure compliance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended.

Impacts of Habitat Modification

There can be short- and/or long-term potential beneficial effects associated with habitat modification, particularly thinning projects designed to encourage faster development of late-successional characteristics. All of the Roaring Creek Density Management treatments would occur in stands which are not yet suitable for murrelet use and are designed to promote late-successional characteristics. The project has been designed to increase growth rates and crowns by reducing competition for the retained trees, to make currently unsuitable nest trees and trees of marginal habitat quality become suitable nest trees sooner than without treatment.

Potential adverse impact to marbled murrelet suitable habitat, or identified individual trees containing potential murrelet nesting structure(s) would be minimized by assuring no trees with potential murrelet nesting structures would be impacted; no opening (i.e., a gap ≥ 0.25 acre in size) would be created within a distance equal to one site-potential tree height of a tree containing potential nesting structure.

Thinning of young stands next to suitable habitat may have a small effect on habitat by removing trees that may be buffering potential nesting trees or by creating an edge which would increase the

risk of wind throw during storms and affect the stability of microclimate along the exposed border, but these effects are expected to be minimal due to the treatments retaining minimum canopy cover of 40 to 60 percent. Light to moderate thinning activities in forest that is not yet suitable or that contain no potential nesting structure would have *NO EFFECT* on murrelets because these areas do not currently contain any potential nesting structure and therefore are not used by murrelets.

There is at least one area adjacent to a proposed Density Management treatment unit (unit 33-1) on BLM land which contains a single, large second-growth Douglas-fir (69 inch DBH) with potential murrelet nesting structure(s). Thinning this area would aid limb development of the retained trees and the development of adjacent cover. Light to moderate thinning in stands that are implemented in accordance with option 3 of the North Coast Province Interagency Level 2 Team policy for the management of potential nesting structure, *MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT* the marbled murrelet because the potential nesting structure would be excluded from the treatment area, although the Density Management treatment has potential to impact the character of the surrounding forest which may be providing some element of cover to the single tree.

There are no identified cumulative impacts to marbled murrelet habitat as a result of the Roaring Creek Density Management Project.

Bald Eagle - (FT)

Impacts to Known Bald Eagle Sites

There are no known bald eagle communal winter roosts within the Analysis Area including in the vicinity of the proposed Density Management project areas. No impacts to any known eagle sites would be expected to result from implementation of the Roaring Creek Density Management Project.

Impacts to the Bald Eagle as Result of the Potential for Disturbance

The potential dates of operation for the proposed project are such that activities may occur which would generate noise above the ambient level during the eagle breeding season (January 1 to August 31). However, there are no known eagle nests or communal roosts within the vicinity of the project and based upon the high visibility of eagles and their nests none are expected. If a new bald eagle nest or roost is discovered, any project activity within 0.25 mile or 0.5-mile sight distance would immediately be evaluated by the unit wildlife biologist for potential effects on bald eagles and mitigated to prevent disturbances.

Because of sufficient knowledge of nesting and/or communal roosting locations it has been determined that disturbances resulting from implementation of the proposed Density Management Project *MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT*, bald eagles due to the low likelihood of affecting unidentified nesting eagles. As a result of harvesting and hauling, the project may generate high activity levels and noise which could displace dispersed foraging, perching or resting eagles; it would be expected that these displaced birds would simply temporarily relocate to other areas containing suitable habitat and lower levels of activity.

Impacts to the Bald Eagle as a Result of Habitat Modification

The crowns of many of the retained trees are expected to rapidly expand and the growth rates increase as a result of the thinning treatments; this would be expected to result in a long-term improvement to the quality of bald eagle habitat. Post-treatment these acres of suitable habitat are expected to continue to function as suitable eagle habitat.

Based upon the potential adverse and beneficial impacts to 47 acres of bald eagle suitable habitat, it has been determined that the Density Management Project *MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT* the bald eagle as a result of habitat modification.

There are no identified cumulative impacts to bald eagle habitat as a result of the Roaring Creek Density Management Project.

2.3.3 Special Status and SEIS Special Attention Wildlife Species and Habitat

See Section 2.3.2 for a description of the watershed.

2.3.3.1 Affected Environment

Mollusks - BS (Bureau Sensitive) and/or Survey and Manage

There are currently seven species of mollusks identified as Bureau Sensitive on the Bureau's Manual 6840 Special Status Species List with the potential of being located within the proposed treatment units and/or in the general sale area; two of these species are also Survey and Manage Species. In general, all of these species are associated with the organic duff layer on the forest floor as well as with habitat types containing sword ferns and a hardwood component, especially big-leaved maple. Additional habitat features utilized by some of these species also include uncompacted, cool, moist soils; hardwood leaf litter; abundant later-decay-class large and small woody debris; and mosses growing on the trunks of big-leaf maples. All of the proposed treatment units contain potential habitat for Special Status and Survey and Manage mollusk species.

Mollusk Surveys

A total of 1,297 acres including the majority (87%) of the proposed Roaring Creek Density Management treatment units were surveyed for mollusks in the spring and fall of 2006 (Hawkes 2006). These surveys resulted in no mollusk species currently on the Bureau's Manual 6840 Special Status Species List and/or identified as Survey and Manage Species being located.

Due to the late additions of two BLM parcels (sections 19 and 25) to the lands being evaluated for inclusion in the Roaring Creek Density Management proposal, four units proposed for treatment (19-1, 19-4, 19-5 and 25-1) totaling 122 acres were not included within the contract for mollusk surveys and were not surveyed. Survey and Manage pre-project surveys, including mollusks surveys, are currently not required for these treatment units due to a Court order exempting thinning projects in stands younger than 80-years-old from pre-project S&M surveys. (See Section 1.2 of the Roaring Creek Projects EA - Conformance with Land Use Plans, Policies and Programs) Stand ages of the four proposed treatment units noted above which were not surveyed for mollusks range from 49- to 55-years-old.

Columbia Torrent Salamander - (BS)

The Columbia torrent salamander is strongly associated with the splash zone directly adjacent to permanently flowing streams and seeps. Relative to the Density Management Project, suitable habitat for this species is located entirely within the no-harvest buffers of the Riparian Reserves that are situated adjacent to the proposed treatment units.

Pre-project surveys conducted for the Roaring Creek Projects resulted in six Columbia torrent salamanders being located near the proposed treatment units. They are assumed to be present wherever there is suitable habitat.

Northern Goshawk - (BS)

Goshawks use a variety of forest types and structural stages as foraging areas but in the west, tend to nest in larger blocks of mature conifer habitats with a relatively dense canopy cover. They tend to

build relatively large nests that can be used by the original pair or successors for many years. With less than six recent records, breeding goshawks are quite rare in the Oregon Coast Range; goshawks use Coast Range habitats more frequently in the winter and during migration.

Limited suitable goshawk nesting habitat exists within the Roaring Creek Wildlife Analysis Area including within the proposed timber management units; the majority of this habitat is considered to be marginal in quality. Although goshawks or goshawk nests have not been observed in the vicinity of the project area, migrating or dispersing birds could periodically use forested stands within and near the proposed treatment units as foraging areas.

NWFP Bats

The NWFP and ROD/RMP identify five species of bats that would benefit from additional habitat protection. Four of these five species have potential of being located within or near the proposed action areas. These species include the fringed myotis, long-eared myotis, long-legged myotis, and the silver-haired bat; they are also covered by the Bureau's Special Status Species Policy as either Bureau Tracking or Bureau Assessment species. All of these bat species are known to inhabit mature and immature coniferous forest and may forage near riparian areas, open areas, over roadways and along forest edges while utilizing green trees or snags with habitat features such as hollow cavities or loose bark for roosting, hibernating, and/or maternity colonies.

There are no known bat roosting or hibernaculum sites within the project area. Snag habitat, especially higher quality large snags, is generally deficient within the area containing the proposed project. Surveys for these species are required under the NWFP and ROD/RMP if caves, mines, or abandoned wooded bridges and buildings are within or near the project area. There are none of these habitat types or structures within or near the project area therefore no bat surveys are required; no bat surveys are scheduled to be conducted within or near the Roaring Creek project area.

Townsend's Big-Eared Bat - (BS)

In addition to the bat species identified within the NWFP, one species of bat, Townsend's big-eared bat, is covered by the Bureau's Special Status Species Policy. Townsend's big-eared bats are seldom abundant but are known to occupy a variety of habitats. In western Oregon, these bats are associated with coniferous forests, but they are also considered characteristic dwellers of caves, abandoned mines, and buildings. No caves, abandoned mines or buildings are known to be located within the vicinity of the proposed action. Some of the more open forested and riparian habitats and roadways within and near the proposed treatment units could function as foraging habitat and it is possible although rather unlikely that this species of bat could be encountered within or near the proposed project areas.

Red Tree Vole (dusky sub-species) - (BS) and Survey and Manage

The red tree vole is generally associated with mature or old-growth conifer or mixed hardwood-conifer forests. The tall, multi-layered canopies of mature or old-growth forests retain humidity and intercept fog, which functions as a climatic buffer and a source of free water. Large branches of mature and old-growth trees provide stable support for nests, protection from storms and travel routes. Although red tree voles have been located within younger stands, especially if they are contain a component of larger remnant trees, mature and old-growth stands are thought to be their optimal habitat. Small portions of the proposed Roaring Creek Density Management Project areas currently contain habitat for the red tree vole albeit marginal in habitat quality.

Survey and Manage surveys, including red tree vole surveys, are currently not required for any of the Roaring Creek Density Management treatment units due to an exemption from the Court to the requirements for pre-project S&M surveys for thinning projects in stands younger than 80-years-

old. The age range for all of the units proposed for treatment within the Roaring Creek Density Management Project is 36 to 75 years.

The Tillamook Resource Area recently completed an effort, unrelated to pre-project surveys, to located red tree voles on eastern slopes/foothills of the northern Oregon Coast Range. Patches of older forest considered to be among the best red tree vole habitat on BLM land within the area were identified and a sample of the trees within these stands were climbed and searched for red tree voles and/or red tree vole nests. In conjunction with this effort, a 98-acre unit corresponding to the proposed Roaring Creek Wildlife Habitat Enhancement unit W19-1 was sampled by climbing 70 trees including numerous residual old-growth. This area is adjacent to three proposed Density Management treatment units (19-1, 19-4 and 19-5). No red tree voles or red tree vole nests were located within this area.

Roosevelt Elk and Black-Tailed Deer

Roosevelt elk and black-tailed deer use a wide range of habitat types. The use of the proposed project areas by these species is considered moderate and the quality of the habitat for these species in the project area is considered to be good. The habitat quality of the area is strongly influenced by the high degree of forest fragmentation in the area and the fact that generally, areas affording hiding cover are adjacent to, and interspersed with, areas containing adequate forage and/or browse.

Higher densities of roads that are open to vehicular traffic within an area can negatively influence habitat utilization and increase elk and deer vulnerability. The Final EIS to the Salem District RMP identifies a general target of 1.5 miles of road open to motorized use per square mile. Looking at all system roads within BLM's GIS database, the current road densities within both the Middle and Upper Tualatin River 6th field subwatersheds, where the majority of the treatment areas occur are relatively high at approximately 4.8 miles/mi². However, roads located behind locked gates or earthen barriers, or overgrown with brush and hardwoods are less accessible and therefore commonly result in less potential for disturbance to wildlife. Due primarily to locked gates on private roads that restrict the general public's access to both Federal and non-Federal lands, a large but unquantified portion of the roads within the area is not accessible by the public and/or drivable. This results in a reduced amount of general disturbance within the area and increases the quality of habitat for Roosevelt elk and black-tailed deer.

2.3.3.2 Environmental Effects Alternative 1: No Action

Under the No Action Alternative the BLM would not implement the Roaring Creek Density Management Project including all associated activities. No Density Management treatment of approximately 906 acres of densely stocked forest within the LSR, AMA and/or Riparian Reserve LUAs would occur. No new temporary roads would be constructed and no existing roads would be renovated and/or decommissioned.

Under the No Action Alternative, the identified adverse and/or beneficial impacts of the action alternative upon wildlife and wildlife habitat would not occur at this site at this time. The local plant and animal communities would be dependent upon and respond to ecological processes that would continue to occur based on the existing condition without management intervention. Relative to the Action Alternative, slowing growth rates and decreasing crown rations of all of the stands proposed for treatment would tend to lengthen the expected time necessary for these stands to develop into late-seral habitat, especially multi-storied, higher quality habitat.

Selection of the "No Action" Alternative would result in several metal or log culverts which have been identified to be at risk of failure not being removed. It is expected that over time, these culverts would continue to fail, periodically sending pulses of sediment downstream which would have an adverse impact upon water quality; affects of this would likely be most prominent during

the wet season especially during and immediately after winter flood events. The only expected wildlife species of concern as identified in Appendix 1 that would be impacted by this reduction in water quality would be the Columbia torrent salamander and/or their habitats; based upon the scale of these potential adverse impacts and the small amount of available salamander habitat that would be impacted, they are considered to be negligible.

There are no identified cumulative impacts to wildlife resources associated with the No Action Alternative. Alternative 1 would not be expected to result in the loss of population viability for any Special Status Species that may occur in the project area, or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

2.3.3.3 Environmental Effects Alternative 2: The Proposed Action

Primarily as a result of the nature and scope of the proposed project (including incorporated design features to minimize the potential for adverse impacts), the nature of the habitats affected and the expected impacts, implementation of Alternative 2 of the Roaring Creek Density Management Project would not be expected to result in the loss of population viability for any Special Status Species that may occur in the project area, or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

Mollusks- (BS) and/or Survey and Manage

The majority (87%) of the proposed Roaring Creek Density Management treatment units were surveyed for mollusks in the spring and fall of 2006 (Hawkes 2006). These surveys resulted in no mollusk species currently on the Bureau's Manual 6840 Special Status Species List and/or identified as Survey and Manage Species being located.

Density Management and associated activities would have some adverse impacts upon mollusk habitat. Thinning of the forest canopy would alter the optimal cool, moist habitat conditions of the forest floor favored by these species; this impact would be most notable within created gaps along slopes with a southern exposure. However, due to design features and based on the expectation that the understory herb and shrub layer would quickly respond, the crowns of the retained trees would relatively rapidly expand and tree general growth rates increase as a result of the thinning treatment. These short-term negative impacts would be expected to gradually ameliorate over time as the stand continues to develop.

The proposed action is expected to result in an increased amount of alder growing within portions of the treatment units which would be expected to result in some benefit to the quality of future mollusk habitat within the density management treatment units. Even though measures are incorporated into the proposed action to minimize soil disturbance and resultant potential adverse impacts to forest floor communities and mollusk habitat, it would not be totally eliminated. Soil disturbance often results in scattered red alder naturally seeding into areas with disturbed soil if a seed source is available.

Based upon the nature of the proposed action, and the fact that the majority of the proposed Roaring Creek Density Management treatment units were surveyed for mollusks resulting in no mollusk species currently on the Bureau's Manual 6840 Special Status Species List and/or identified as Survey and Manage Species being located, it would not be expected that the project would result in a threat to the potential maintenance and enhancement of the any S&M mollusk species at a site. Additionally, the project would not be expected to result in the need to elevate any special status mollusk species to any higher level of concern including the need to list under the ESA.

Columbia Torrent Salamander - (BS)

Built into the design of the Density Management Project, no-harvest buffers along fish-bearing streams are generally at least 100 feet and 60 feet along non-fish-bearing streams. These "no-harvest" riparian buffers would provide adequate protection to any Columbia torrent salamanders and torrent salamander habitat within the area.

The Density Management proposal includes replacing an existing log culvert located in section 3 with a temporary pipe, as well as some road decommissioning including the removal of approximately nine existing culverts that are located on live streams. There is potential that the replacement and/or removal of these culverts could impact a few individual animals and very localized stretches of suitable torrent salamander habitat. Project design features would help minimize the potential for adverse impacts. It would be expected that should there be any adverse impacts upon torrent salamander habitat they would be negligible and short-term as the impacted areas would rapidly recover.

As a result of the nature and scope of the proposed project, the expected impacts, and the amount of suitable torrent salamander habitat present that would not be impacted, implementation of the Action Alternative (Alt 2) of the Roaring Creek Density Management Project would not be expected to result in the loss of population viability for Columbia Torrent Salamanders or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

Northern Goshawk - (BS)

The proposed action is expected to have minor adverse and beneficial impacts upon goshawk habitat although overall these impacts are considered to be negligible. This is based upon the low likelihood of goshawks currently utilizing the area, the nature of the forested stands to be impacted and various project design features.

The Density Management treatments would be expected to result in some long-term beneficial impacts to goshawk habitat by maintaining or increasing the growth rates of reserve trees thereby favoring the development of some mature conifer habitat features. Implementation of Alternative 2 of the Roaring Creek Density Management Project would not be expected to result in the loss of population viability for Northern Goshawks or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

Red Tree Vole (dusky sub-species) - (BS) and Survey and Manage**Impacts to Red Tree Vole Habitat**

Density management would be likely to degrade the current suitability of some of the treated stands in the short-term (less than 20 years) by temporarily removing adjoining tree crowns, but suitability is expected to be enhanced in the long-term (20 years or more). Treatments are expected to maintain a post-harvest average canopy closure of approximately 49% to 64%. The reserve trees generally favored for retention would be the largest within the stand; they are expected to begin to respond to the thinning with an accelerated growth rate and increased crown development within a few years after the harvest. This would result in the long-term expected impact of a higher quality of vole habitat within the treatment units sooner than would be expected to develop without treatment.

As a result of the nature and scope of the proposed project, the expected impacts, and the amount of conifer habitats present that would not be impacted, implementation of the Roaring Creek Density Management Project would not be expected to result in the loss of population viability for red tree voles or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

Bats (including NWFP bats and the Townsend's Big-Eared Bat)

The Roaring Creek Project would be expected to immediately improve the quality of bat foraging habitat within some portions of the density management treatment units by opening up the canopy and creating small fragmented gaps in an otherwise closed canopy. Additionally, thinning treatments greatly increase sunlight to the floor of the treated stands which increases herbaceous growth for bats' insect prey.

The project's design features for CWD, snag and green tree protection and retention, including those trees with features desirable to species such as bats, should provide adequate structure for roosting or resting bats and greatly reduce any short- and/or long-term adverse impacts to bats which may result from the proposed project. Within the units proposed for thinning, there is potential for long-term benefits to bats based upon the fact that the treatment would favor the development of some older forest characteristics favored by these species; growth rates of reserve trees would be increased or maintained resulting in larger trees and eventually larger CWD developing sooner than with no treatment.

Alternative 2 of the Roaring Creek Density Management Project would not be expected to result in the loss of population viability for any of the bat species analyzed or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

Roosevelt Elk and Black-tailed Deer

Potential Disturbance Impacts

It is expected that the Roaring Creek Density Management Project would temporarily displace individual deer and elk as they react to the disturbance created by project implementation and the increased human presence within the vicinity of the treatment units. This would not impact the health of the populations based upon the expected limited length of time of the disturbance and the fact that other, relatively undisturbed suitable habitat is present within the vicinity of the proposed action.

The combination of the proposed action and connected actions associated with implementation would result in a net decrease of approximately 2.4 mile of roads within the Analysis Area; this would benefit the quality of deer and elk habitat within the area through reducing the potential for disturbance. The new temporary road construction associated with the project should not result in increased public access and resulting big game harassment because private landowner's gates are generally locked and therefore limit the public's access into the project area, as well as the plan to decommissioning the road segments immediately post-harvest.

Habitat Modification

From a habitat perspective, the Roaring Creek Density Management Project would likely result in a combination of relatively minor beneficial and adverse impacts. The basic configurations of the treatment units would be expected to result in an overall improvement in the general habitat quality available for elk and deer. Although the proposed action would have an adverse impact upon cover for big game, other suitable thermal and/or escape cover exists within the general area. In addition to the reserve areas, the acres receiving a thinning treatment should continue to function in some regard as cover for big game. Although thermal cover is probably less important or limiting within the Coast Range of northern Oregon than in other portions of the species' range, due to both the mild winters and summers within the region, forested stands which have been commercially thinned should still serve to moderate temperature and wind extremes, as well as serve as a visual buffer. The project is not expected to result in a reduction of available cover to point where it would be become a limiting factor, negatively impacting the population health of these species.

In addition, the proposed treatments would be expected to improve the vigor and abundance of the grass, herb and/or shrub understory layers within the density management thinning units thereby improving the quality of available forage and browse. It would be expected that the areas treated with a Density Management harvest should provide higher quality browsing and foraging areas for a period of at least 15 years.

2.3.4 Soil Resources

This section discusses soil on-site effects. Off-site soil effects including sediment delivery and water runoff are discussed in the Water Resources (Section 2.3.5).

The analysis area includes timber harvest units in the Roaring Creek Timber Sale and secondary and spur roads used to access the proposed timber harvest units.

The main soil resource concern with this project is how the proposed actions or lack of action will affect slope stability and soil productivity.

2.3.4.1 Affected Environment

The following descriptions and interpretations used to describe the setting and to characterize the soils in the project were acquired from GIS data, Washington and Yamhill County Soil Surveys (NRCS, 1982 and 1974), and field evaluations by the Tillamook Resource Area Soil Scientist. Fragile sites not suitable for commercial timber harvest were identified during pre-project and project planning and removed from the proposed timber sales. Areas where future landslides might be expected were traversed and checked for indicators of instability. A few additional, small fragile areas will probably be identified and removed upon closer examination during the timber sale layout.

Setting

The proposed treatment areas are located on the east side of the Oregon Coast Range Geomorphic Province near Willamette Valley. The underlying bedrock geology consists mostly of marine volcanic rock, primarily basalt (Tillamook Volcanics and Siletz River Volcanics). Marine sedimentary rock (Yamhill Formation), mainly sandstone, occurs in the eastern portion. The lower, eastern portion of the project area is covered by re-worked eolian deposits (material moved by air) of volcanic ash and windblown silt (i.e. loess).

The area is characterized by highly dissected hills and mountains and narrow river valleys. The dominant landforms within the proposed project area are rounded ridgetops, mid-slope benches, and steep hillslopes. Many of the mid-slope benches are composed of a complex of ancient landslide blocks and lateral scarps. They are commonly bound by short (usually less than 150 feet long), steep slopes. Some benches have hummocky ground with shallow depressions, some of which have water at or near the surface for much of the year. These ancient landforms were probably formed by earthquakes.

A combination of steep slopes, weak and fractured rock, mixed geologies, past landslides, and high rainfall make the area prone to slumping and landsliding. Deep-seated slumps, earthflows, and creep are the dominant mass-wasting processes on the benches and hill toeslopes, while debris slides contribute smaller amounts from shallow, very steep, convex hillslopes. Deep-seated landforms are either dormant or slow moving, responding to seasonal groundwater changes.

Natural forces cause most deep-seated landslides. Deep-seated landslides can be triggered by human activities which remove the base of the slide, add weight to the top of slide, or divert water onto an unstable surface. Most active landslides in the area are associated with improper road construction and maintenance, especially near stream crossings and clear cutting on very steep terrain (shallow landslides). Landslides in mid-seral stands are infrequent and mainly small (<0.2 acres) and isolated. There are approximately 22 acres (<3% of the proposed harvest units acreage) on slopes greater than 70%.

Soil Disturbance

Existing soil conditions within the project area are a result of past actions and disturbances. The main past actions that have contributed to current soil conditions are the extensive logging (clearcut) and road building that occurred in the project area during the late 1950s to early 1970s. Currently, about 7% of the soils within the proposed ground-based harvest units and approximately 1% of the skyline harvest units have heavy compaction, rutting and topsoil displacement. This is based upon soil scientist field observations and review of aerial photos. Most disturbances are confined to primary skid trails, access roads and landings. Most of these surfaces are currently covered by brush and a few small trees. There also has been some OHV use on a few existing roads.

Soil Types

The dominant soils in the project area are the Olyic silt loam, Tolke silt loam, Hembre silt loam, Laurelwood silt loam, and Pervina silty clay loam (USDA, SCS, 1982, and USDA, SCS, 1974). These soils are deep to very deep, moderate to moderately slowly permeable. They have high organic matter content and low bulk density. The soil surface layer is about 10 to 17 inches thick with textures of mainly silt loams with few rock fragments. The thickness and condition of the surface layer is a critical factor affecting tree growth. Textures generally become finer with depths. Pervina soils differ by having fine texture throughout their profiles and moderate permeability. Except for small, seasonally wet areas in some depressions and along streams, the soils are well drained. Soils on the steeper slopes generally are shallower and have higher rock fragment contents. Project soils have moderate to severe erosion hazards when the soil surface is exposed. They are also highly susceptible to compaction.

Site-specific, growth-determining factors for the project area include a favorable growing climate, an intact forest floor and canopy, and soils with beneficial properties for growing forest vegetation. Project soils are highly susceptible to compaction and once deeply compacted require long periods to recover if they are not treated.

Project soils in general have moderately good physical and biological properties for growing forest vegetation. The climate is mild (mesic) with cool winter and warm, dry summers. Soils are usually moist. The Pervina series, located in Unit 1-1, with finer textured subsoils and lower average annual precipitation appear to be at risk of moisture stress during the summer months. The site index, the most common measure for potential forest productivity, is high and moderately high, ranging from 155 to 173 for Douglas-fir, 100-year basis (USDA –SCS, 1968).

2.3.4.2 Environmental Effects Alternative 1: No Action

There would be no direct effects to soil resources from the proposed action. There would be no new soil disturbance and erosion from project actions and no cumulative effect to soil resources. Current conditions and trends as described in the Affected Environment (Section 2.3.4.1) would continue.

Landslides would continue to infrequently occur in the untreated timber stands. Because only periodic road maintenance would occur, roads would continue to deteriorate and erode. Some road segments would likely fail within the next 20 years. Soils would continue to very slowly recover from the effects past compaction until there is another major disturbance such as wildfires or windstorms.

Cumulative Effects

Because the no action alternative would not alter current condition or trends, when combined with other past, present, and reasonably foreseeable actions, there would be no incremental cumulative effect to soil resources.

2.3.4.3 Environmental Effects Alternative 2: The Proposed Action

Slope Stability

Ground disturbing activities and vegetation removal would slightly increase the risk of slope instability. However, the risk would remain low for the following reasons: 1) New road construction and road renovation would be on stable terrain, gently sloping ridges and benches. 2) Surface water would be prevented from flowing onto potentially unstable slopes by outsloping and placement of drainage structures such as culverts and waterbars. 3) Only about 22 acres (less than 3%) of the proposed harvest units acreage have very steep slopes (>70%). Other than steepness of slope they lack field indicators of slope instability. 4) The proposed action would be a moderate thinning prescription. Trees retained would help stabilize the slopes through root reinforcement and maintenance of evapotranspiration rates. 5) Landslide occurrences on very steep slopes in mid-seral stands are uncommon in the area. 6) BMPs and PDFs would minimize soil disturbance. Yarding would occur on seasonally dry soils. Full log suspension would be used on sensitive sites. At least one-end suspension on all logs would be required in all other cable and ground-based logging areas.

The slight increase in risk of instability would be offset by repairing and stabilizing the following roads:

- Section 25- Repair a fill-slope failure on the 1-6-25 road.
- Section 29- Remove an undersized culvert and decommission approximately ½ mile of road with some potential instability.
- Section 33- Remove two log culverts and decommission up to nearly a mile of un-named road with several unstable sites.

Soil Productivity

Soil productivity can be affected by soil disturbance and the soil characteristics and climate where the disturbance takes place. For the purposes of this analysis, soil disturbance is defined as any movement or compression of soil from forest management activities which alters the physical, chemical, or biological properties of a soil. The primary types of soil disturbance of concern for this project are heavy compaction, rutting, and topsoil displacement. The risk of soil productivity losses would be minimized by BMPs and PDFs (Section 2.2.3.2).

Table 4 displays expected soil disturbance from project activities. This estimate is based on past post harvest monitoring, the preliminary logging plan, BMPs, and project design features. The actual amount could vary. Important factors include the skill of the operator, how much slash are on skid trails and how dry the soils are when they are yarded, the amount of traffic on skid trails, and the kind of equipment used.

Table 4. Projected Project Soil Disturbance

Project Activity	Arial Extent of Disturbance	Type of Disturbance
527 acres of Ground-Based Yarding (About 58% of all harvest units)	The area composed of skid trails and landings would comprise <10% of the total ground-based harvest units (totaling <52.7 acres including about 7.7 acres within RR) If all units are harvested with a crawler/skidder system, there would be approximately 5 to 7% of harvest units (26 to 37 acres) with new moderate and heavy compaction, displacement, and rutting. If all units are harvested by a cut-to-length system, there would be approximately 3 to 5% of harvest units (16 to 26 acres) new disturbance.	Harvest units would be logged by one or combination of the following logging systems. If crawler/skidder systems are used, disturbance would consist mostly of nearly continuous moderate to heavy compaction and some displacement and mixing in landings and primary skid trails (spaced approximately 150' apart) and spotty light to moderate compaction and some mixing in secondary trails. If cut-to-length systems (e.g., harvesters) are used, disturbance would consist mostly of disperse, discontinuous light and moderate compaction and minor displacement and mixing in trails (spaced approximately 50' apart) and moderate to heavy compaction on landings and widely spaced yarding trails. After completion, most landings would be subsoiled.
379.5 acres of Skyline Yarding (About 42% of all harvest units)	Approximately 1% of all skyline harvest units (approximately 4 acres including about 3.3 acres in RR)	Moderate and heavy compaction and gouging confined to landings and narrow <4ft wide skyline corridors. About half of the landings would be located in roadbeds.
4 miles of New Temporary Road Construction	7.8 acres	New road construction would remove the topsoil and compact the subsoil. Temporary roads would be narrow and have clearings of about 20 to 25 feet in width. These clearings would be similar to the spacing in treated harvested units subsequently would have a small effect on timber stocking. After timber harvest, all new roads would be decommissioned.
Up to 5.6 miles of Road	Up to 2.7 acres	Most road renovation would be in the existing detrimentally disturbed areas. Approximately 25% of

Renovation		the renovation would occur on soils that have partially or fully recovered from past disturbance. Disturbance would include topsoil removal and subsoil compaction. Road clearing would have a minimal effect on timber stocking. After timber harvest, all renovated roads would be decommissioned.
Fuel Treatment	<1 ac	Burning of slash piles would occur during wet soil condition thereby reducing potential heat damage to the topsoil. Burning would result in scattered, spotty topsoil damage including mineralization of nitrogen and possible changes in soil structure and reduction in infiltration.

Few studies have been completed analyzing the effect of skid trails on tree height or volume growth over time. The probability of adverse effects to soil productivity (soil quality) is generally the greatest with high silvicultural intensity conducted on sites with low inherent productivity and stressful climates (*Beschta, 1995*).

Recent studies in the Pacific Northwest have found tree growth response from disturbance can range from positive to negative and show a high degree of site specificity (*Ares, et al., 2005*). In a ten year study, researchers reported annual seedling growth reductions (-10%) on severely disturbed soils in the Oregon Cascades occurred for 7 years after planting (*Heninger, et al., 2002*). After ten years, tree growth rates were similar on disturbed and undisturbed sites. In contrast, in an area with wetter and milder climate with soils high in organic matter and lower clay contents, severe soil disturbance on two coastal Washington sites did not result any reduction in growth rates on Douglas-fir seedlings.

Growing conditions and soil properties at the project area appear to be in the middle of the coastal Washington and the Oregon Cascades sites. Unlike the two studies, ground-base yarding would be conducted when the soils are dry and soil impacts should be less severe. Additional project design features would minimize soil disturbance. Based upon the preceding and with proper project implementation, soil disturbance from the timber yarding would not be expected to impair overall stand growth and long-term productivity.

Constructing 4 miles of roads and renovating up to 5.6 miles of roads would result in the long-term loss of soil productivity on approximately 10.5 acres (approximately 1.2% of all proposed harvest units). After the timber harvest is completed, all of the 4 miles of new and 5.6 miles of renovated roads used in the project and an additional 1.0 mile of existing natural-surface roads (1.9 acres) in the project vicinity would be decommissioned. Decommissioning would include subsoiling, re-establishing natural drainage patterns, out-sloping, waterbarring, seeding and/or planting, blocking access, and/or scattering woody debris on the road surface. This action would improve soil conditions for growing forest vegetation by increasing soil porosity and reducing bulk density, improving soil drainage by increasing water infiltration, decreasing water runoff and surface erosion, and by reducing potential slope and drainage failures.

Project actions would increase the amount of soil compaction and soil displacement. If the ground-based harvest units are re-entered in less than 10 to 25 years, there would be potential for additional or cumulative effect, especially if the routes of heavy equipment (e.g., roads, landings, and main skid trails) are not reused. Because the effects on soils would be localized, there would be no cumulative effects outside of the project area.

Cumulative Effects

Because project action is not expected to alter the overall slope stability in the project area (slight increase in risk of instability would be offset by repairing and stabilizing roads), it is unlikely to result in a cumulative or additive effect.

Project actions would increase the amount of soil compaction and soil displacement; consequently a potential loss in long-term soil productivity. There would be a potential for additional or cumulative effect if ground-based harvest units are re-entered within a short period (less than 10 to 25 years) and the routes of heavy equipment (e.g., roads, landings, and main skid trails) are not reused. Impacts to soil resources over the landscape would continue to occur on private lands from management activities such as road building, clear-cutting and subsequent broadcast burning. However, all impacts on soil resources from project action would be local and would not have a cumulative effect at the landscape level.

2.3.5 Water Resources

This section discusses water resources effects. On-site soil effects of slope stability are discussed in the Soil Resources section (2.3.4).

The analysis area varies with the affected parameter but generally includes the project site and all the watersheds and subwatersheds in which timber harvest, fuels reduction, and road activities occur.

The main water resources concern with this project is how the proposed actions or lack of action will affect stream flows, channel conditions, sediment and turbidity, water temperature, and dissolved oxygen.

2.3.5.1 Affected Environment

The primary sources used to characterize the hydrology resource include the following: BLM GIS data, aerial photographs, documents available online from the Oregon Department of Environmental Quality (ODEQ), Oregon Department of Water Resources, Upper Tualatin-Scoggins Watershed Analysis, Oregon Department of Fish and Wildlife (ODFW) Habitat Inventory on Roaring Creek, and field evaluations by the Area Soil Scientist. Because the harvest area in Turner Creek subwatershed is very small and that it is located on a gentle ridgeline far away from streams in a comparable watershed, the focus of the characterization will be on Scoggins Creek watershed.

Setting

The project area is almost entirely within the Scoggins Creek 5th field watershed (HUC #1709001002). The Scoggins Creek watershed is about 86,900 acres in size and is drained by the Tualatin River and two major tributaries, Scoggins Creek and Wapato Creek. The proposed timber harvest areas are located primarily within the Upper Tualatin River (15,211 acres) and Middle Tualatin River (17,970 acres) subwatersheds. Approximately 13 acres of the proposed harvest area is in the Turner Creek subwatershed (9,860 acres) of the North Yamhill River 5th field watershed. Most of the project actions would occur within the upper Roaring Creek drainage. Elevations within the proposed harvest units range from 410 feet to 2,240 feet. Rain-on-snow area, considered to be between 2,000 and 3,000 feet in elevation, covers approximately 93 acres (0.5%) of the Middle Tualatin River subwatershed and 6,416 acres (42%) of the Upper Tualatin River subwatershed. The climate is modified maritime with mild, wet winters, and warm, dry summers.

The watershed is rain dominated. Most precipitation occurs as rainfall in the fall and winter months averaging about 45 to 85 inches annually. Summer months are generally dry. Streamflow is highly variable and is strongly linked to seasonal rain patterns.

Natural and Human Disturbances

The following discussion on disturbances and their effects focuses on the upper, forested portion of the watershed (Table 5). Most of this information was obtained from the Upper-Tualatin-Scoggins Watershed Analysis. For a more complete description, refer to that document.

The vast majority of land in the Scoggins Creek watershed is utilized for forestry (approximately two-thirds) and has been harvested within the past 80 years. About 87% of the forested land within the watershed is privately owned and about 11.8% is owned by Oregon Department of Forestry. Most of that land is managed with short rotations. BLM manages, in a checkerboard pattern, 4.5% of the forested land in the watershed and about 10.6% (3,535 acres) of the two affected subwatersheds.

Road densities, based upon BLM GIS analysis, are 4.8 mi/mi² for both the Middle Tualatin and Upper Tualatin subwatersheds and 5.4 mi/mi² within Turner Creek. The actual road mileage is probably an additional 5 to 10% higher due to new roads and roads earlier missed in the inventory.

Table 5. Effects of Past and Foreseeable Disturbances on Water Resources

Disturbance	Effect	Result
Tillamook Wildfires 1933 to 1951	Isolated patches of project area burned	Accelerated surface erosion and landsliding. Increased large woody debris (LWD) levels in streams. Reduced future LWD recruitment.
Storms 1955/56, 1964/65, 1996/97	Stream channels	Increased sediment delivery, increase scour and increased channel bed elevation.
Past Timber Harvest 1918-1958 Extensive logging on canyons in Upper Tualatin River 1962 -1970 Most of project area & vicinity clearcut & reforested with Douglas-fir	Removed vegetation and streamside shade.	Decreased LWD in channels, decreased LWD recruitment potential, increased sediment in streams, reduced roughness, increased channel simplification, increased surface area, decreased channel stability, and increased stream temperatures.
Existing Vegetative Cover	Approximately 10 to 22% of the affected subwatersheds harvested	Potentially affecting streamflow. Increasing mass movement, erosion and sediment inputs. Potentially increasing stream temperatures. Reducing future levels of LWD in stream channels.
Foreseeable Future	Continued	Potentially affecting streamflow.

Disturbance	Effect	Result
Timber Harvest 2007 ODF Sunday Drive Timber Sale partial cut harvest on 488 acres in S7 & 8, T01S, R05W and S12 & 13, T01S, R06W	removal of vegetation from timber harvest. Approximately 12 to 27% of the affected subwatersheds harvested	Increasing mass movement, erosion and sediment inputs. Potentially increasing stream temperatures. Reducing future levels of LWD in stream channels.
Past Road Conditions. (Old construction practices resulting in deep cuts and deep fills.)	Increased overland and subsurface flow and erosion	During the 1996 storm event, several road failures occurred within the project vicinity, primary at stream crossings and steep fill slopes. Increased sediment to streams. Increased channel network and drainage efficiency.
Current Road Conditions	Roads & forestlands are less disturbed by recreational activities.	Approximately 2.7% of land in each affected subwatershed is currently covered by roads. decreasing infiltration and increasing surface water runoff. Most new roads are secondary & spur roads. After they are used most will be left in a undisturbed state allowing them to stabilize and revegetate. Most roads locked behind private gates, earthen barriers, or brush.
Forseeable Future Road Conditions	Small number of new road (mainly small spurs). Some road removed. Improved maintenance of private and state roads.	Road density will probably slightly increase.

1. Estimate based upon visual delineation from 2005 aerial photos within the forested portion of the subwatershed. The Upper Tualatin River subwatershed is all forestlands. Approximately 78% of the Middle Tualatin River is forested. Most of the non-forested land is bottom lands along streams which is used primarily for agriculture.

Project Area Streams

A majority of streams adjacent to proposed timber units are small (1st and 2nd order), non-fish bearing streams. They typically have flows under 2 cubic feet per second (cfs) and bankfull widths of less than 5 feet. Channels are strongly to moderately confined by hillslopes. Gradients are widely variable, ranging from 2 to 40%. Channel types are mostly cascade and step-pool. Channel

substrates are dominated by gravel, cobbles, and boulders. About a quarter of the streams are on gentle benches with channel types dominated by riffles and channel substrates dominated by fine gravel, fine sands, and silts.

All of the large streams (3rd or 4th-orders) are fish-bearing. All harvest units adjacent to these streams would be skyline yarded. There are nearly 11,400 feet of the Roaring Creek reaches located within 200 feet of proposed harvest units, and there are approximately 600 feet reach of mainstem Lee Creek (4th-order) within 200 feet of a proposed harvest unit. Within Roaring Creek, channels are mainly terrace and hillslope constrained, and gradients average 3% to 5%. Channel types are dominated by rapids and scour pools. The primary channel substrates are silt and organic fines and gravel. Several of these reaches show evidence of beaver activity.

Beneficial Uses

The major beneficial uses of water in Scoggins Creek watershed include domestic and municipal consumption, cold water fisheries, recreation, irrigation, manufacturing, livestock watering and wildlife.

The project area lies within two municipal watersheds: the Cities of Forest Grove and Hillsboro and the Cities of Hillsboro and Cherry Grove. The nearest domestic water diversion is the Hillsboro Reservoir, a 1.5 surface acre municipal reservoir owned by the City of Hillsboro, located on the Tualatin River west of Haines Falls in the SE 1/4 of section 20, T.1S, R.5W. This is approximately ½ mile downstream from proposed density management treatment areas in section 29, and over a mile from the nearest proposed road work. The municipal water is treated at a slow sand filter plant that serves local communities. Currently the state of Oregon does not have water quality standards for BLM for protecting municipal water sources. The water plant has experienced high turbidity and nutrient problems in the past (R. Settler, City of Hillboro Personal Correspondence, 10/31/2006). There are no other known diversions for drinking water within 10 miles downstream of the project area.

Water Quality

State water quality standards are designed to protect the most sensitive beneficial uses. The most sensitive beneficial uses dependent on surface water draining the project area are for domestic water and cold-water fisheries habitat, including salmonid fish rearing and spawning. The key water quality parameters critical to these designated beneficial uses are dissolved oxygen, water temperature, sediment, turbidity, and riparian and aquatic habitat.

Water quality is generally good in the forested portion of the watershed with cool temperatures and well-oxygenated (USDI, 2000). Most water quality problems occur in the lower portion of the watershed. Little water quality data has been collected on streams in the project area.

Water quality standards are determined for each water body by the Oregon Department of Environmental Quality (ODEQ). Water bodies that do not meet water quality standards are placed on the state's 303(d) list and later given a Total Maximum Daily Load (TMDL) allocation. A TMDL is the quantity of pollutant a water body can receive and still meet Oregon water quality standards. The table below provides a list of parameters within the Upper Tualatin-Scoggins Creek Watershed

Table 6. Water Quality Parameters

Parameter	Water Body	State Status	General Comments	Local Conditions
Dissolved Oxygen (DO)	All streams within the watershed	TMDL approved 2002. No project streams have been placed on the 303(d) list	Increases in water temperature and runoff of volatile solids (sediment & organic matter) can reduce DO levels in water below healthy levels for beneficial uses.	No known data collected on project streams. However, the existing DO concentrations are probably high (See effects analysis)
Water Temperature	All streams within the watershed	TMDL approved 2002. No project streams have been placed on the 303(d) list	Loss of trees near streams can reduce streamside shade and increase water temperature above healthy levels for beneficial uses.	No known data collected on project streams. Current streamside shade levels appear to be adequate to buffer streams from temperature increases. This is based upon 22 solar pathfinder measurements taken on mainstem Roaring Creek, and a review 2005 aerial photographs, and spot field observations.
Iron and Manganese	Lower watershed boundary to Tualatin R. headwaters (RM 60.0 to 80.8)	Added to the 303(d) list in 2004. TMDL needed	Little information available. May be a drinking water concern (see discussion below table)	No known data collected on project streams. Many of the projects soils are acidic and contain high natural levels of iron and aluminum.

The effects of proposed management activities on iron and manganese in streams were not analyzed because little is known about this water quality parameter. According to the Draft Tualatin River Subbasin TMDL, the exceedance appears to be a result of the natural geochemical environment and regional groundwater hydrology, and poor buffering in the basin (ODEQ, 2004/2006). Standards will be re-evaluated in future triennial standards reviews.

Instream large woody debris (LWD) is a key structural component of riparian and aquatic habitat and performs several important geomorphic functions. It dissipates excessive stream energy, protects streambanks from erosion, and buffers against downstream sedimentation impacts. Based upon aquatic data collected on Roaring Creek by Oregon Department of Fish and Wildlife (ODFW, 2006), LWD is “low” in middle (Reaches 1,2) and “moderate” in middle and upper reaches (Reaches 3-9). Wood volume in remaining project streams appear to be “moderate to high”.

Although not listed for impairment by ODEQ, turbidity and sedimentation are water quality concerns (USDI, 2000). Turbidity levels in some of the roadside ditches and project streams have been observed by BLM employees to be high during winter storm events. ODFW ocular data indicates that within the Project Area (reaches 3-7) fines (sand, silt, and organic fines) averaged 41%, ranging from 30% to 64% in the channel substrates. Data collected by BLM on two reaches of Roaring Creek in Section 34 found 26% fines within riffles and glides. The data was collected using Environmental Monitoring and Assessment Program protocol and Relative Bed Stability analysis developed by the Environmental Protection Agency.

A comprehensive sediment source investigation has not been done. However, based upon field observations and knowledge of the local geology, the primary source of fine sediment inputs to upper Roaring Creek appears to come from deep-seated mass wasting. The steep topography, geology, and erosive soils in the Roaring Creek watershed make this area highly susceptible to surface erosion, slumping and landslide activity (USDI, 2000). The topographic benches in the central portion of Section 33 currently show signs of deep-seated slope movement. The lower portion of this ancient slide terrain is moving downhill, encroaching upon streambanks and causing small-scale bank failures on much of upper Roaring Creek. During high streamflows heavy loads of fine sediment and organic material are carried into stream channels.

Most of the human caused sediment is coming from poorly maintained native surface roads, especially during winter use. Many roads within the project area have undersized culverts that are often too widely spaced. Some road surfaces have surface erosion problems. There also have been many road-related slope failures; several occurred on BLM roads during the 1996/97 storm.

Water resource parameters that are critical to the beneficial uses which could potentially be affected from the proposed action are streamflows, channel conditions, sedimentation and turbidity, water temperature, and dissolved oxygen (DO).

2.3.5.2 Environmental Effects Alternative 1: No Action

There would be no direct effects to water resources from the no action alternative. No forest management, road building, or decommissioning would occur. Current conditions and trends as described in the Affected Environment section (2.3.5.1) would continue.

Sediment would continue to be routed to streams from Federal, state, and private lands. The current lack of road maintenance is likely to continue, and the road system will continue to degrade, adding sediment and increasing turbidity in local streams. Without maintenance, several culverts may fail within the next 25 years, potentially delivering several hundred cubic yards of sediment to local streams. Most of the source of fine sediment in the upper Roaring Creek will continue to come from deep-seated, slow moving mass movement (soil creep, rotational slumping, and earthflow).

Cumulative Effects

Effects of past and foreseeable actions are described in Table 5 under Section 2.3.5.3 Affected Environment. Under the No Action Alternative, no cumulative effects would occur. The current condition, which is a result of previous forest management activities, would be maintained. A possible exception would be from the effects of eroding roads (See immediately above). Sediment deposition and turbidity would likely become worse over time if left untreated. No future BLM projects are planned to occur within the watershed.

2.3.5.3 Environmental Effects Alternative 2: The Proposed Action

Streamflows

The primary ways by which forest management can increase base and peak flows are vegetation removal (e.g. timber harvest) and road construction.

Timber Harvest Effects on Base Flows

Current conditions indicate that the project area is at low risk of annual base flow enhancement. Research indicates that measurable increases in annual base flows begin to become detectable when about 25% of a catchments vegetation cover is removed in rain-dominated catchments and at about 20% for catchments within the transitional, rain-on-snow zone (Stednick, 1996). Both of the affected catchments are below these thresholds.

The proposed timber harvest could theoretically increase base flows at the site or reach scale. However the amount of increase would be very small and would be unlikely to have any biological or physical significance. Treated areas would retain 50% of the canopy. After thinning, the remaining vegetation would quickly use the newly available soil moisture, thereby maintaining annual flows.

Timber Harvest Effects on Peak Flows

A preliminary hydrologic analysis for the risk of increased peak flow as result of timber harvest was analyzed using the Oregon Watershed Assessment (OWEB, 1999). Two subwatersheds (Upper Tualatin River and the Middle Tualatin River) in the timber sale were evaluated using a weighting system based on the percent of forestry land in area where rain-on-snow (ROS) events dominate and the percent of the area with crown closure of less than 30%. Table 7 displays data used in the analysis and Figure 5 shows the graph used to estimate peak flow risk.

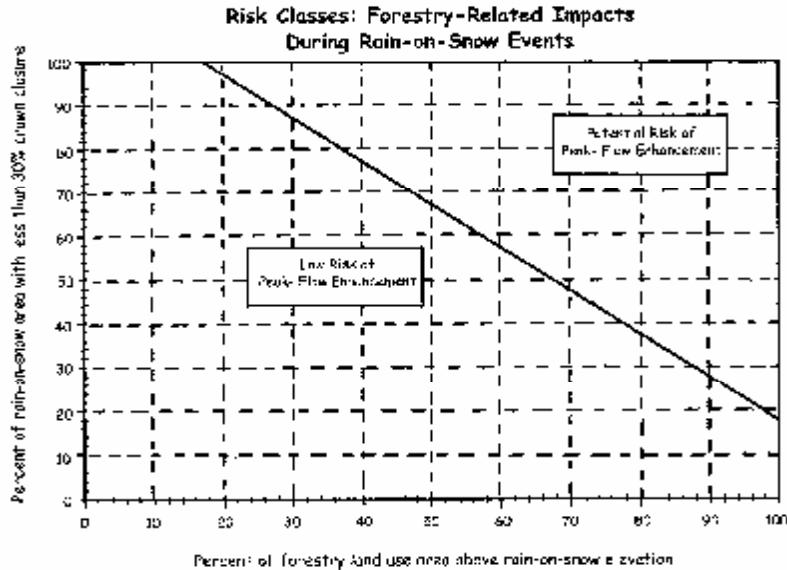
Table 7. Hydrologic Assessment

Subwatershed Name (Area)	% Area in ROS ¹	Current % Occupied by Roads	Current % <30% Crown Closure	Future % Occupied by Roads ³	Future % Early Seral ²
Upper Tualatin River (15,211 acres)	42	2.5	10 (mainly within ROS)	3	15 (mainly within ROS)
Middle Tualatin River (17,970 acres)	0.5	2.5	22	3	27 ⁴

¹ Assumes ROS lower boundary is 2,000 feet. ² Assumes an increase of 5% increase from timber harvest.

³ Assumes an increase of 0.5% in roads. ⁴ Most land in the ROS managed by the Oregon Department of Forestry. There are several planned timber sales in this area. All are thinning, none are clearcut treatments.

Figure 5. Risk of Peak Flow Enhancement



The risk of peak flow enhancement was determined by graphing the percent of area in rain-on-snow with less than 30% crown cover with the percent area in the rain-on-snow zone.

Based upon this analysis, both the Upper Tualatin River and the Middle Tualatin River are currently at low risk for enhancement of peak flows. The proposed timber harvest would not change this assessment. The project would maintain a canopy closure of 50% in the treatment areas in a rain dominated watershed.

Road Construction

The primary means by which roads can alter streamflows is by intercepting subsurface flow and routing the flow directly to the stream channel via road ditches and culverts. The most critical roads are those that are built with deep road cuts, are on mid-slopes, are over shallow soils, or drain directly into stream channels (Coe, 2004). According to OWEB (1999), the potential risk for peak flow enhancement begins when roads occupy more than 4% of its land surface.

The proposed road construction is unlikely to measurably change streamflows for the following reasons. All new temporary roads in the proposed timber sale would be built on ridgetops or benches on mostly very deep soils; none of them would drain directly into streams. Road renovation on the existing 5.6 miles of road would not alter the current stream networks and therefore would have a neutral effect. A small length of new temporary roads would still keep less than 3% of the affected subwatersheds occupied by road surfaces. Upon project completion all of the new temporary roads, roads renovated and an additional 1.0 miles of existing natural surfaced roads would be decommissioned.

In conclusion, the proposed action is not expected to result in measurable increases in stream flows. The project would maintain a canopy closure of 50% in the treatment areas, nearly all in rain dominated portion of the watershed. Several studies have found that partial cuttings on a small portion of the area at any one time have no important effects on streamflow (Beschta et al, 1995, Adams and Ringer, 1994).

Channel Conditions

With the exception of some small areas in road drainage crossings in the project area, the proposed action would not directly alter any stream channels. All ground-based yarding equipment would be kept away from stream channels and wetlands. Where skyline yarding is used, logs would be fully suspended within 25 feet of streams (Refer to *Section 2.2.3.2 Project Design Features*).

Replacing one culvert and removing approximately 9 culverts at stream crossings would disturb their channel beds and streambanks and may result in minor, short-term (1 to 3 years) channel adjustments. Nearly all affected streams are small (<2 feet wide) intermittent or nearly intermittent headwaters. The largest stream is a 3rd order tributary of Roaring Creek in section 34 where a existing 48 inch culvert placed in moderately deep roadfill would be removed. In the long-term (greater than 3 years), this action would have a beneficial effect by reducing the risk of future road failure and improve stream channel form and function.

The removal of trees from riparian areas and Riparian Reserves may reduce the amount of LWD that could potentially be recruited into stream channels and shape stream morphology. This action, however, is expected to have little to no effect to future LWD. Trees would not be removed from the 60 to 100 feet no-cut buffers or areas prone to instability (where much of the LWD would come from), and trees that would be retained would be larger sized. In the long-term, density management would accelerate the growth of larger diameter trees that would provide long-term sources of large wood for in-stream habitat.

Sedimentation and Turbidity- The primary means by which the proposed action could contribute sediment and turbidity to local streams are timber yarding, road work, and timber haul.

Timber Yarding Timber yarding is unlikely to affect the turbidity and sediment in stream channels where sensitive beneficial uses are present for the following reasons: 1) The risk of mass failures as a result of this project was analyzed in the Soil Resources section and were found to be low; 2) Skid trails and ground-based yarding equipment would not be allowed within the Riparian Reserves except where equipment could operate from an existing road or skid trail; 3) Yarding would be restricted to periods of low soil moisture; 4) No-harvest buffers (min. 60 feet for non-fish bearing streams and min. 100 feet for fish bearing streams) would be placed along both sides of streams; 5) Yarding is not expected to cross any streams; 6) Most sediment produced from logging would travel a short distance before being trapped by duff, woody materials or other obstructions. For these reasons, any sediment that enters streams from yarding is expected to be small and have an immeasurable and inconsequential effect on the sediment and turbidity in channels where sensitive beneficial uses are present.

Road Work Proposed road work would likely cause a small amount of sediment to be moved into some of the local stream channels. Road work includes new temporary construction, renovation, decommissioning, and timber hauling.

With the project design and the incorporation of Project Design Features (PDFs) and Best Management Practices (BMPs), sediment delivery would be greatly minimized. All road work would occur during the dry season when water runoff is not likely and there is very little water flowing in channels. All work in live streams (e.g., culvert replacement) would be done during the ODFW instream work window (July 1 to September 30).

The proposed action will temporarily add approximately 4.0 miles of natural surface spur roads. These roads would be built on or near ridgetops and topographic benches. They will not cross any intermittent or perennial streams. The only new road construction in Riparian Reserves that is

anticipated is in Unit 3-1 (600 feet) and Unit 29-1 (800 feet). The closest a spur road comes to a stream channel is about 100 feet in Unit 3-1 and about 70 feet in Unit 29-1. Streams are small intermittent, 1st order and should be dry or nearly dry when the roads are constructed. In Unit 3-1, they subsurface a short distance below their origin and disappear into the ground. Nearly all of the sediment generated from the construction of the roads would be captured on hillslope before it reaches stream channels.

Road work most likely to generate sediment would be the replacement of two (2) culverts and removal of 9 culverts. The amount of sediment generated from replacing and removing culverts replacement is estimated to average about one cubic yard for each event. Only three of the streams at these crossings are perennial. Since the culvert replacement or removal would occur during the dry season when there is little flow, there should be very little downstream movement of sediment after the work is completed. Most of the sediment would move downstream in the first high flow events of the first winter when turbidity levels are normally at their highest.

The expected increases in sedimentation and turbidity would be offset by repairing and decommissioning 6.6 miles of existing roads, including many that are eroding and or are likely to fail in the future. Based on the current budgetary climate and current road maintenance levels, these roads are not expected to be fixed under BLM's road maintenance program. They include the following roads:

- Section 25- Approximately 150 feet of deeply gullied section of the 1-5-36.1 road.
- Section 25- Deeply eroded fill-slope failure on the 1-6-25 road caused by improper road drainage.
- Section 31- Over 100 feet of deeply eroded segment of the 1-5-32.1 road.
- Section 29- Several hundred feet of deeply eroding section of an unnamed road.
- Section 33- An un-named road in the northern part of Section 33 that has badly slumped.
- Section 33- About 1 mile of road in the south portion of the section with segments having water flowing down them and having 2 or 3 failing stream crossings.

Timber Haul Very little sediment delivery is expected because all timber hauling would be restricted to the dry season. The majority of timber hauling would be on rock-aggregate surfaced roads. Increases in sediment from timber hauling would occur during the first heavy rains in the fall.

In conclusion, proposed actions would likely result in short-term (up to 3 years) increases of sedimentation and turbidity. Most sediment that is delivered to streams during the dry season would travel short distances and not reach fish bearing reaches due to the limited ability of these streams to carry sediment. After the first heavy rains, the stored generated sediment would be released and transported downstream and out of the project area as suspended sediment. The expected increases in sediment from the project action would be offset by repairing existing eroding roads and roads that could fail in the future.

Water Temperature

The proposed and connected actions would not measurably change water temperatures in streams in the project area. The proposed treatment would meet the effective shade criteria in the Northwest Forest Plan Temperature TMDL Implementation Strategies USFS & BLM, 2005). No-harvest buffers would be placed along all streams adjacent or within harvest units. Nearly all non-fish bearing streams are less than 5 feet in width, most are intermittent. A 60 foot no-harvest buffer would protect nearly all shade needed to maintain or improve stream temperatures (the primary shade zone). Canopy closure in the area adjacent to the no-harvest buffer (the secondary shade zone) would be reduced to no less than 50 percent.

Because the proposed and connected actions are not likely to have an effect on water temperature, they are also not likely to have an incremental cumulative effect.

Dissolved Oxygen (DO)

The proposed and connected actions are not likely to result in measurable effect to DO concentrations. Project streams are cold, well-aerated forested streams that are relatively resistant to management actions that could affect DO concentrations. The primary way forest management activities can affect DO is by increasing water temperature. Temperature can reduce DO solubility and it can increase the sediment oxygen demand by increasing the rate of nitrification and decay of organic matter. The proposed action would maintain the high level of shade along project streams thereby keeping streams cold. The proposed action would add some organic material and fine sediment to local streams, however most of the organic matter would be coarse, mainly tree boles, in skyline corridors. The amount of fine sediment would be small with the implementation of PDFs, seasonal restrictions, and locations of project actions (Refer to Sedimentation and Turbidity assessment above).

Since the proposed and connected actions are not likely to result in measurable effects to DO concentrations, they would also not be likely to contribute to any potential cumulative effects to DO.

Cumulative Effects

The proposed action is unlikely to measurably change streamflows (see discussion above under **Streamflows**). It is therefore unlikely to contribute to any potential additive or cumulative effects to streamflows.

Other than possibly sediment, the proposed action is unlikely to have a measurable effect to water quality including channel characteristics, temperature, channel characteristics, DO concentrations, or water temperature. It is therefore unlikely to contribute to cumulative effects to these parameters.

The spatial scale for cumulative effects for sediment deposition is adjacent streams within and downstream from the project area. This scale is chosen because the effects resulting projection action would be expected to overlap in time and space could be observable downstream where they occur in a shared watershed. Dominant land-use activities on non-federal lands adjacent to the action area are forestry. Roads are the greatest source of human-related sediment with the assessment area, as typical in forested watersheds in the Pacific Northwest. Other landowners within the assessment area are building new roads and are improving road systems to reduce their sediment production. Most of the eroded material in the upper Roaring Creek appears to originate from natural sources, mainly from deep-seated mass wasting. This assessment will evaluate how one or both of these sources may combine to result in an adverse impact.

The proposed road building, repairing, decommissioning, and timber hauling would likely result in short-term (less than 3 years) increases in turbidity directly below road/stream intersections. Nearly all of the project generated sediment would be stored in small channels above fish bearing reaches during the dry season. Project design features and best management practices would minimize sediment production and the limited ability of these streams to carry sediment. Most of the fine sediment would be transported downstream and out of the project area over a couple years during high flow events when turbidity levels are at the highest. During this period, increases in sediment and turbidity would be offset by repairing and decommissioning road segments (described above) that are eroding and or are likely to fail in the future. Background sediment production from natural

mass wasting and surface erosion, bank erosion, and channel deposits would not be measurably altered. Consequently, this proposed action and the known and anticipated activities on private lands in the analysis area are not expected to change the sediment regime at the 5th, 6th or 7th-field watershed scale, and would therefore be unlikely to have any effect on designated beneficial uses.

2.3.6 Threatened or Endangered Fish Species or Habitat

2.3.6.1 Affected Environment

The fisheries analysis area for the Roaring Creek timber sale consists of the entire Roaring Creek Watershed and the reach of the Upper Tualatin River in T.1S, R.5W sections 19-21. In this analysis area the BLM manages 2654 acres, 906 of which are proposed for treatment under this density management project.

There are three species of anadromous fish; Upper Willamette steelhead trout (*Oncorhynchus mykiss*), coho salmon (*O. kisutch*), and Pacific lamprey (*Lampetra tridentata*) known to inhabit the upper Tualatin watershed (including Roaring Creek), as well as resident cutthroat trout, reticulate sculpins and Western brook lamprey. Of these species only Upper Willamette steelhead is currently listed under the Endangered Species Act as threatened. It can be assumed that prior to extensive timber harvest, road construction, and settlement, fish habitat was most likely in better condition than it is today. Better habitat was most likely associated with large woody material entering the stream channels creating complex habitat and pools desirable for fish production and survival. Fish passage was not affected by dams or water diversions and water quality was generally better except following major forest stand replacement events such as fire.

Fish Species Distribution

Upper Willamette steelheads are known to migrate and spawn in Roaring Creek and in the Tualatin River below Haines Falls. There is limited historical data available on fish habitat and distribution in the watershed.

The distance from each individual treatment unit to Upper Willamette steelhead is summarized in Table 8.

Table 8. Distance from Treatment Areas to listed fish/habitat (at closest point)

Unit	Stream	Proximity to Listed Fish/Habitat (miles) Upper Willamette Steelhead
1-1	Roaring Creek	0.5
3-1	Roaring Creek	0.19
19-1	Lee Creek	2.1
19-4	Upper Tualatin	2.2
19-5	Upper Tualatin	2.15
25-1, 25-2	Unnamed Tributary to Upper Tualatin	2.6
29-1	Upper Tualatin	0.16
29-2	Upper Tualatin	0.64
29-3	Upper Tualatin	0.72
29-4	Roaring Creek	0.03
31-1	Roaring Creek	1.04
31-2	Roaring Creek	1.17

33-1	Roaring Creek	0.02
34-1	Roaring Creek	0.04
35-1	Roaring Creek	0.03

Existing Habitat Conditions

Data for the Upper Tualatin River is derived from the February 2000 Upper Tualatin-Scoggins Watershed Analysis and aquatic habitat inventories completed by the Oregon Department of Fish and Wildlife (ODFW) in 1993 and 1997. Data for Roaring Creek is more extensive and current as it is from a 2006 aquatic habitat inventory conducted by ODFW.

Steelhead, coho salmon, and cutthroat trout vary in their seasonal habitat utilization but all require structurally diverse channels for the maintenance of healthy populations. In general, coho salmon occupy middle stream reaches while cutthroat and steelhead trout occupy upper reaches. During high flow periods associated with winter and spring, juvenile coho salmon, steelhead and cutthroat trout depend on the low velocity habitats provided by pools, backwaters, and off-channel alcoves. Adult salmon and trout also use pools and wood structure for shelter from predators and for resting. During low flow periods zero to one year old steelhead and cutthroat trout inhabit higher velocity areas associated with riffles, while coho salmon continue to use pools. Two year and older steelhead and cutthroat trout generally prefer the deepest pool habitat. In Coast Range streams, large wood pieces and accumulations play a vital role in maintaining channel complexity and fish populations. Large woody debris (LWD) creates scour, recruits and maintains spawning gravel, creates rearing pools and increases channel complexity. Habitat surveys were conducted by private and public entities in the western portion of the Upper Tualatin-Scoggins watershed, and are included in a database maintained by ODFW (ODFW 1999). These surveys indicate generally desirable conditions (using ODFW benchmarks) for LWD volume in the Tualatin River and its tributaries above (and including) Sunday Creek. Desirable conditions were also found for Lee Creek below 1,450 feet elevation and Sain Creek above 600 feet elevation.

Data for the Roaring Creek section comes from surveys conducted by the Oregon Department of Fish and Wildlife's Aquatic Habitat Inventory project; surveys were conducted in 2006. The Roaring Creek habitat survey began at the confluence with the Tualatin River and continued upstream 8,274 meters ending at the headwaters. Nine reaches were designated based on channel morphology, change in valley width index, and tributary junctions. The reach channels varied between hillslope and/or terrace constrained and unconstrained within a wide floodplain. Land use consisted of young and mature trees, timber harvest and second growth timber. Silt and organic fines, gravel, cobble, and sand were the primary substrate types. Rapids, scour pools, riffles, and cascades were the dominant habitat types. Large wood volume was low in the lower reaches and progressed to moderate in the upper reaches. The trees found most frequently in the riparian zones were hardwoods 3-30cm and conifers 30-50cm (based on twenty riparian transects). Evidence of beaver activity was documented. For a more detailed description of the individual reaches, see '2006 AQI habitat' (Project Record Document # 18).

2.3.6.2 Environmental Effects Alternative 1: No Action

No forest management activities would occur within the proposed project areas at this time. Forested stands within the project area would continue to grow and develop without management intervention, although at a slower rate in areas heavily infected with *Phellinus weiri* root disease. The identified effects of the action alternatives would not occur at this site at this time. There would be no new roads or landings built or additional ground disturbance from forest management activities. There would be no short-term minor inputs of sediment from culvert replacements. Without maintenance, several culverts may fail within the next 25 years, potentially delivering

several hundred cubic yards of sediment to local streams. Sediment would continue to be routed to streams from Federal, state, and private lands. The current lack of road maintenance is likely to continue, and the road system will continue to degrade, adding sediment and increasing turbidity in local streams. Most of the source of fine sediment in the upper Roaring Creek will continue to come from deep-seated, slow moving mass movement (soil creep, rotational slumping, and earthflow).

Cumulative Effects

As described in sections 2.3.4.3 and 2.3.5.2 the no action alternative is likely to result in sediment and turbidity conditions that are greater than what would occur in an undisturbed (no human disturbance) watershed. This may result in adverse effects to Upper Willamette Steelhead populations if the current road/stream crossings continue to degrade and roads are left in their current condition.

2.3.6.3 Environmental Effects Alternative 2: The Proposed Action

Timber Yarding

As discussed in the hydrology analysis (section 2.3.5.3), timber yarding is unlikely to increase sediment delivery to streams. There are four units that would have a portion (approximately 3,872 feet) of their boundary located approximately 200 feet from waters potentially inhabited by Upper Willamette steelhead. All of these thinning units would be cable yarded and there are no anticipated yarding corridors crossing streams. Any sediment that enters streams from yarding from the result of this action is expected to have an un-measurable and insignificant effect to beneficial uses for the following reasons; 1) Hillslopes in harvest units are stable with little potential for mass wasting; 2) Skid trails and ground-based yarding equipment would not be allowed within the Riparian Reserves except where they could be operated from an existing road or skid trail; 3) Yarding would be restricted to periods of low soil moisture; 4) No-harvest buffers (min. 60 feet for non-fish bearing streams and min. 100 feet for fish bearing streams) would be placed along both sides of streams; 5) Yarding is not expected to cross any streams; 6) Most sediment produced from logging would travel a short distance before being trapped by duff, woody materials or other obstructions; 7) Yarding on slopes greater than 70% would have full log suspension.

Areas within the harvest units having slopes greater than 70% are generally 0.5 acres or less in size and are widely scattered. Most of these areas are located inside the unit boundaries with gentler slopes surrounding them which would trap any minor sediment disturbed when the log is initially lifted into the air. There are a couple of slopes greater than 70% located along unit boundaries. In unit 35-1 there are approximately 0.6 acres of steep slopes proposed for harvest along the unit boundary. There is an old skid road below these areas that would effectively trap and hold indefinitely any small amounts of sediments that may be released. This skid road is well vegetated and is approximately 25 feet wide. In unit 34 -1 there are two areas that are along the unit boundary having slopes greater than 70%. One of these areas is located above the old Roaring Creek road (proposed for decommissioning) which would effectively trap and store any small amounts of sediments released when the log is initially lifted. The other steep slope section in this unit has approximately 175 feet of it's boundary along a small 2nd order stream channel near the streams origin. This section of stream is approximately 1,890 feet from UW steelhead, slopes are well vegetated below the harvest unit, there is a high volume of slash and LWD in the channel, and the channel is most likely dry or flowing very little in this area during a large portion of the summer season. With the implementation of the project design features (see section 2.2.3.2), distance from harvest units to UW steelhead (including steep slopes), generally small stream sizes near units, and topographic features preventing sediment routing directly to stream channels there are no likely impacts to UW steelhead as a result of implementing this project.

Road Construction, Renovation, and Decommissioning

As discussed in the Hydrology analysis (section 2.3.5.3), road construction, renovation and decommissioning activities may contribute small amounts of sediments (<1 cu yard each) most likely following culvert removals. The road construction and renovation may contribute sediment to local streams but BMPs implemented during construction and project design features (see section 2.2.3.2) would keep the volume of sediment entering local waterways at levels that would have an immeasurable effect on ESA listed fish. None of the proposed temporary new roads would have stream crossings or be located adjacent to fish bearing streams. Streams are small intermittent, 1st order channels and would be dry or nearly dry when the roads are constructed.

There is one stream crossing in unit 31-1 that would be replaced prior to haul. This crossing is on a small 1st order stream located approximately 1.1 miles above Upper Willamette steelhead. There would be no impacts to UW steelhead from this culvert replacement and removal due to distance from listed species, small stream size, and small amounts of anticipated sediment (< 1 cu yd) generated as a result of this action. Most of the sediment generated would move through the stream system during periods of high flows when normal sediment background levels are high..

The other stream crossing to be replaced prior to haul is located in unit 3-1, at the very upper extent of fish habitat (Reticulate sculpins only, approximately 1981 ft from crossing to UW steelhead)). In Unit 3-1, the stream flows subsurface below the road crossing for a short distance and disappears into the ground before re-emerging farther down the slope. There are no likely impacts to UW steelhead as a result of replacing this culvert and its subsequent removal due to distance from listed species, subsurface flow, small stream size, and small amounts of anticipated sediment (< 1 cu yd each) generated as a result of this action. Most of the sediment generated would move through the stream system during periods of high flows when normal sediment background levels are high.

Culvert removals in section 33 would have no effect on UW steelhead. These culverts are located on small 1st order non-fish bearing streams with low gradients, beaver ponds below the removal areas and approximately 1,666 feet from UW steelhead.

Culvert removals in section 29 would have no effect on UW steelhead. These crossings are located on small 1st order non-fish bearing streams with shallow fill, would be dry or nearly so at time of culvert removal and are no closer to UW steelhead than approximately 1.0 miles.

Culverts removed in section 1 are all located on very flat topography and would have no effect on UW steelhead. Stream areas below the channel are characterized by low gradients and swampy/marshy sections. The streams in this area are non-fish bearing and would be dry or nearly dry at time of culvert removal. It is approximately 3,208 feet from the closest culvert to UW steelhead.

Culvert removals in sections 25 and 31 are located on small 1st order non-fish bearing stream very near their origins. Both of these crossings would likely be dry during culvert removal. UW steelhead are no closer than 3.2 miles and 1.1 miles respectively and as such there would be no effect on UW steelhead.

Due to the distance of the culvert removals, associated with the road decommissioning, to listed Upper Willamette steelhead, the small magnitude of the sediment releases (<1 cu yd each), the generally small stream size associated with culvert removals, and the spatial and temporal distribution of the culvert removals throughout the project area there are no anticipated measurable impacts to Upper Willamette steelhead. Indirect long term benefits of the road decommissioning to

listed fish would be a more stable road system that would no longer contribute sediment to streams and a net decrease in the road density in the watershed of 1.0 miles.

Timber Hauling

As discussed in the Hydrology analysis (section 2.3.5.3), hauling timber is unlikely to contribute any measurable, quantifiable sediments to streams due to haul being restricted to dry season only.

Stream Temperature

As discussed in the hydrology analysis (section 2.3.5.3), actions associated with the proposed action would maintain the current stream canopy closures and would not have any effect on stream temperatures and as such there is no causal mechanism to affect fish or their habitat.

Physical Integrity

With the exception of some small areas in road drainage crossings in the project area, the proposed action would not directly alter any stream channels. All ground equipment, with the exception of some road drainage crossings, would be kept away from stream channels and wetlands. Where skyline yarding is used, logs would be fully suspended within 25 feet of streams (Refer to *Section 2.2.3.2 Project Design Features*).

Replacing 2 culverts and removing approximately 9 culverts at stream crossings would disturb stream channel beds and stream banks which would result in minor, short-term (1 to 3 years) channel adjustments. Nearly all affected streams are small (<2 feet wide) intermittent or nearly intermittent headwaters. As discussed in the hydrology analysis (*refer to section 2.3.5.3*) and in the project design features (*refer to section 2.2.3.2 Project Design Features*) the magnitude of anticipated sediment generated from this removal would be immeasurable and insignificant where Upper Willamette steelhead are located. In the long-term (greater than 3 years), this action would have a beneficial effect by reducing the risk of future road failure and improve stream channel form and function.

LWD

Approximately 26% of the proposed density management (about 244 acres) would occur within Riparian Reserves. These Riparian Reserve treatments would occur outside “no-harvest” buffers that would be placed along streams. Restrictions would apply on ground-based logging equipment within Riparian Reserves which would effectively result in some of the no-harvest buffers adjacent to ground-based yarding units being increased in width to up to approximately 180 feet. Harvesting trees within the Riparian Reserve would directly remove a potential source of small wood to stream channels. This small wood is recognized to be an important element in both sediment routing and nutrient cycling processes for the aquatic system. The implementation of this thinning using design features such as “no harvest” buffers on all streams, cable yarding on slopes over 35%, and yarding corridors perpendicular to streams in Riparian Reserves would minimize potential negative effects. The Curtis relative stand density following treatment would range from 31 to 35. A Curtis relative stand density of greater than or equal to 30 following timber harvest has been accepted by NOAA fisheries as having no measurable effect to either large woody debris recruitment or shade to stream channels. Although the thinning of riparian reserves removes some potential small diameter wood available for future stream recruitment small diameter wood does not last as long and is more readily moved out of the system than large diameter wood. Thinning is expected to accelerate the growth rate of the trees that remain in the Riparian Reserves and increase the quality and volume of large woody debris naturally recruited to the stream channel, improving beneficial uses in the future. Beneficial uses include fish habitat and as such this project would improve on the current condition of LWD inputs where ESA listed species are found.

Road Density

As described in the proposed action (connected actions section 2.2.3.1) there would be a net decrease in road mileage as a result of this project of 6.6 miles.

Streamflow

As discussed in the hydrology section of this analysis (section 2.3.5.3) the proposed action is unlikely to measurably change stream-flows at the project area or affected sub-watershed scale and as such there is no causal mechanism to affect fish.

Cumulative Effects

The proposed action is expected to result in small but immeasurable changes to water quality with no likely impacts to T & E species at the scale of the sixth and seventh field watersheds. The proposed action when combined with other actions (cumulative effect) occurring on private forest lands in the watershed would be unlikely to have any negative impacts on any designated beneficial uses, including fish in the short term (1-3 years). Any effects to these attributes as a result of the Proposed Action would be within the range of effects disclosed in the RMP/FEIS (p. 4-14 to 4-19). Most of the sediment generated as a result of the proposed action will be stored in small non-fish bearing stream channels during the dry season. The long term (3+ years) cumulative impacts associated with the removal of 6.3 miles of roads, improved road/stream crossings, road maintenance activities, and increased growth and vigor of trees in the riparian zone (future LWD areas) associated with the proposed project would result in improvement of the indicators listed above for T & E species.

2.3.7 Fish Species with Bureau Status and Essential Fish Habitat

2.3.7.1 Affected Environment

When the Magnuson-Stevens Act (MSA) of 1976 was re-authorized in 1996, it directed Regional Fishery Management Councils to identify Essential Fish Habitat (EFH) for commercial fish species of concern. Effects analysis contained here address potential effects to EFH (i.e., effects to coho salmon habitat). Essential Fish Habitat is defined as ‘those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10))’. There are no fish species with bureau status in the proposed project area.

The fisheries analysis area for the Roaring Creek timber sale consists of the entire Roaring Creek Watershed and the reach of the Upper Tualatin River in T.1S, R.5W sections 19-21 and 30. In this analysis area the BLM manages 2654 acres, 906 of which are proposed for treatment under this density management project.

See Section 2.3.6.1 (Threatened and Endangered Fish Species or Habitat) for a description of fish species present in the Roaring Creek watershed.

Existing Habitat Conditions

Data for the Upper Tualatin River is derived from the February 2000 Upper Tualatin-Scoggins Watershed Analysis and aquatic habitat inventories completed by the Oregon Department of Fish and Wildlife in 1993 and 1997. Data for Roaring Creek is more extensive and current as it is from a 2006 aquatic habitat inventory conducted by the Oregon Department of Fish and Wildlife.

Coho salmon, steelhead and cutthroat trout vary in their seasonal habitat utilization but all require structurally diverse channels for the maintenance of healthy populations. In general, coho salmon occupy middle stream reaches while cutthroat and steelhead trout occupy upper reaches. During high flow periods associated with winter and spring, juvenile coho salmon, steelhead and cutthroat

trout depend on the low velocity habitats provided by pools, backwaters, and off-channel alcoves. Adult salmon and trout also use pools and wood structure for shelter from predators and for resting. During low flow periods zero to one year old steelhead and cutthroat trout inhabit higher velocity areas associated with riffles, while coho salmon continue to use pools. Two year and older steelhead and cutthroat trout generally prefer the deepest pool habitat. In Coast Range streams, large wood pieces and accumulations play a vital role in maintaining channel complexity and fish populations. Large woody debris (LWD) creates scour, recruits and maintains spawning gravel, creates rearing pools and increases channel complexity. Habitat surveys were conducted by private and public entities in the western portion of the Upper Tualatin-Scoggins watershed, and are included in a database maintained by ODFW (ODFW 1999). These surveys indicate generally desirable conditions (using ODFW benchmarks) for LWD volume in the Tualatin River and its tributaries above (and including) Sunday Creek. Desirable conditions were also found for Lee Creek below 1,450 feet elevation and Sain Creek above 600 feet elevation.

The Roaring Creek habitat survey began at the confluence with the Tualatin River and continued upstream 8,274 meters (5.14 miles) ending at the headwaters. Nine reaches were designated based on channel morphology, change in valley width index, and tributary junctions. The reach channels varied between hillslope and/or terrace constrained and unconstrained within a wide floodplain. Land use consisted of young and mature trees, timber harvest and second growth timber. Silt and organic fines, gravel, cobble, and sand were the primary substrate types. Rapids, scour pools, riffles, and cascades were the dominant habitat types. Large wood volume was low in the lower reaches and progressed to moderate in the upper reaches. The trees found most frequently in the riparian zones were hardwoods 3-30cm and conifers 30-50cm (based on twenty riparian transects). For a more detailed description of the individual reaches see ‘2006 AQI habitat’ document in the project record.

2.3.7.2 Environmental Effects Alternative 1: No Action

No forest management activities would occur within the proposed project areas at this time. Forested stands within the project area would continue to grow and develop without management intervention, although at a slower rate in areas heavily infected with *Phellinus weiri* root disease. The identified effects of the action alternatives would not occur at this site at this time. There would be no new roads or landings built or additional ground disturbance from forest management activities. There would be no short-term minor inputs of sediment from culvert replacements. Without maintenance, several culverts may fail within the next 25 years, potentially delivering several hundred cubic yards of sediment to local streams. Sediment would continue to be routed to streams from Federal, state, and private lands. The current lack of road maintenance is likely to continue, and the road system will continue to degrade, adding sediment and increasing turbidity in local streams. Most of the source of fine sediment in the upper Roaring Creek will continue to come from deep-seated, slow moving mass movement (soil creep, rotational slumping, and earthflow).

Cumulative Effects

As described in sections 2.3.4.3 and 2.3.5.2 the no action alternative is likely to result in sediment and turbidity conditions that are greater than what would occur in an undisturbed (no human disturbance) watershed. This may result in adverse effects to EFH and MSA populations if the current road/stream crossings continue to degrade and roads are left in their current condition. Adverse effects include increased sedimentation to spawning habitat and increased potential of road prism failure, resulting in a decrease in productivity of forage species and siltation of spawning beds.

2.3.7.3 Environmental Effects Alternative 2: The Proposed Action

There are no specific criteria described in the regulations to assess for effects to EFH. The definitions for *EFH*, *Waters* and *Substrate*, suggest the following criteria be evaluated; water quality, water quantity, substrate characteristics, large woody debris (LWD) within the channel and LWD source areas, channel geometry, fish passage, and forage species (aquatic and terrestrial invertebrates).

Essential Fish Habitat Analysis

Water Quality, Water Quantity, and Substrate Characteristics

As described in the hydrology analysis (section 2.3.5.3) the proposed action is unlikely to alter the current conditions either by affecting stream flows, physical integrity, water temperature, or the sediment regime. Implementation of the proposed action would raise minor fisheries concerns due to the potential input of sediment into streams from timber harvest, road construction, reconstruction, or decommissioning, and/or use of haul roads.

Most of the increase in sedimentation would occur during the first year or two after disturbance. Most sediment would likely be stored in the upper reaches of streams where it would remain until a storm event occurs and transports it downstream, adding an immeasurable portion to the sediment load. In the long-term, decommissioning roads, associated with the timber sale would decrease sediment delivery and turbidity levels, improving water quality and no longer impacting substrate characteristics.

Large Woody Debris (LWD) in channel and source areas

Approximately 26% of the proposed density management (about 244 acres) would occur within Riparian Reserves. The Proposed Action enters Riparian Reserves in an effort to improve the riparian stand condition with silvicultural prescriptions intended to increase growth and vigor of riparian stands in portions of the project area. Restrictions would apply on ground-based logging equipment within Riparian Reserves which would effectively result in some of the no-harvest buffers adjacent to ground-based yarding units being increased in width to up to approximately 180 feet. Harvesting trees within the Riparian Reserve would directly remove a potential source of small wood to stream channels. This small wood is recognized to be an important element in both sediment routing and nutrient cycling processes for the aquatic system. Small diameter wood does not last long and is more readily moved out of the system than large diameter wood. The implementation of this thinning using design features such as “no harvest” buffers on all streams, cable yarding on slopes over 35%, yarding corridors perpendicular to streams in Riparian Reserves, and dry-season operation for all road work and haul would minimize potential negative effects. Thinning would accelerate the growth rate of the trees that remain in the Riparian Reserves and increase the quality and volume of large woody debris in the future. This would provide improvement of future sources of in-stream wood in headwater reaches above and near EFH.

Fish Passage

The Roaring Creek Commercial Density Management project would have no effect on fish passage. This project neither creates nor improves fish passage culverts and as such has no effect on EFH or MSA species.

Forage Species

Juvenile coho forage primarily on insects that fall into streams from adjacent riparian vegetation and drifting aquatic insects in the water column. Most of the riparian areas within the project area have mixed stands of hardwoods and conifers with a dense shrub understory. Substrate in stream

channels is a mix of gravels, cobbles and boulders that provide good quality habitat for macro-invertebrates. Limited sediment inputs associated with culvert removal and no treatment of riparian stands within the 60 to 100 foot “no harvest” buffer would occur, thus avoiding adverse affects on existing in-stream woody material levels or recruitment rates to area streams. A recently completed study on the impacts of streamside shrubs and trees found that forage species were greater in areas with abundant streamside shrubs and trees (Romero, Gresswell, and Li 2005). Treatment of riparian stands where EFH is reached would have no effect on forage species in EFH areas where MSA species are found.

Channel Geometry

Installing approximately 2 culverts and removing approximately 9 culverts at stream crossings would disturb stream channel beds and stream banks and may result in minor, short-term (1 to 3 years) channel adjustments. Nearly all affected streams are small (<2 feet wide) intermittent or nearly intermittent headwaters. The implementation of the Roaring Creek Commercial Density Management project would only result in small, immeasurable sediment inputs and no changes to LWD within the 60 and 100 foot ‘no harvest’ buffer. Due to the small, immeasurable nature of the sediment inputs, project design features (see section 2.2.3.2) and no changes to LWD where EFH is reached there is no causal mechanism to affect channel geometry or pool characteristics.

Road Density

As described in the proposed action (connected actions section 2.2.3.1) there would be a net decrease in road mileage as a result of this project of 6.3 miles. As road related sediment inputs are a major concern in this watershed, the reduction of road mileage would have a beneficial effect on MSA species and EFH by eliminating 6.3 miles of roads and sediments generated on them. These roads would no longer contribute sediment that affects any of the EFH characteristics described above. Removal of 6.3 miles of roads would have a beneficial affect on MSA species and EFH by eliminating a chronic source of sediment.

Cumulative Effects

The proposed action is expected to result in small but immeasurable changes to water quality and the fish habitat indicators at the scale of the sixth and seventh field watershed. These effects would be unlikely to have any negative cumulative impacts on any designated beneficial uses, including fish in the short term (1-3 years). Any effects to these attributes as a result of the Proposed Action would be within the range of effects disclosed in the RMP/FEIS (p. 4-14 to 4-19). The effects of the proposed action combined with actions occurring on other land ownerships in the watershed would not likely have any measurable impacts to MSA species and EFH. Most of the sediment generated as a result of the proposed action will be stored in small non-fish bearing stream channels during the dry season. The long term (3+ years) cumulative impacts associated with the removal of 6.3 miles of roads, improved road/stream crossings and road maintenance activities associated with the proposed project would result in improvement of the indicators listed above for MSA species and EFH.

2.3.8 Invasive, Nonnative Species (Executive Order 13112)

2.3.8.1 Affected Environment

Existing vegetation consists of a 50-70 year-old conifer over-story, scattered pockets of hardwoods, an under-story of common shrubs and scattered populations of grasses and forbs. A comprehensive plant list is located at the Tillamook Resource Area field office. A variety of habitats are represented throughout the project area (substrates, rock, features, elevations, slopes, aspects, water, and

topography). Any ground-disturbing activity that occurs within these habitats offers opportunity for the introduction of noxious weeds and/or invasive non-native plant species based on the existence of a seed source. Botanical surveys for Invasive, non-native plant species within the Roaring Creek project were conducted in Spring of 2006 and 2007. Where mature native plant communities are established, non-native species were non-existent. Non-native invasive species that were identified within the proposed project areas consisted of Bull thistle, (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), Scotch broom (*Cytisus scoparius*), Tansy ragwort (*Senecio jacobaea*), Himalayan blackberry (*Rubus discolor*), evergreen blackberry (*Rubus laciniatus*), St. Johns-wort (*Hypericum perforatum*), shining geranium (*Geranium lucidum*), oxeye daisy (*Leucanthemum vulgare*), and Reed canary grass (*Phalaris arundinacea*). These species were located along road edges and exposed areas that tended to have soil disturbance (i.e. open meadows, riparian areas and OHV trails). Most of these species are considered Priority III (established infestations) on the Oregon Department of Agriculture (ODA) Noxious weed list. These aggressive non-native plant species are prevalent throughout Western Oregon and proliferate easily through vectors such as motor or foot traffic, birds, wind, and water. Ground disturbing activities such as new road construction, reconstruction and decommissioning, bank stabilization, yarding corridors, tractor skid trail development, landing use, and haul road maintenance are the most likely activities that could produce conditions conducive to noxious weed establishment. Some degree of noxious/exotic weed introduction or spread is probable as management activities occur in the project areas.

2.3.8.2 Environmental Effects Alternative 1: No Action

Plant communities within the project area would continue to be dependant on ecological processes currently in place if no action is taken. No appreciable increase in the non-native or invasive plant species populations identified during the field surveys is expected to occur within the interior of existing stands. However, as regeneration harvest occurs on lands adjacent to public lands an increase of non-native invasive plant species will invade the areas where exposure to higher intensities of light have been introduced and seed sources become established.

Cumulative Effects

No cumulative affects would occur with a no action alternative.

2.3.8.3 Environmental Effects Alternative 2: Proposed Action

Commercial Density Management Thinning with Culvert Replacement and Road Decommissioning Minimal Effect - Priority III noxious weed species found were located along existing roadways. Initial increase in population size and new establishment due to density management thinning activities should be confined to disturbance areas as described above in “affected environment” and would be expected to decrease over time as native species re-vegetate and the recovery of canopy closure occurs. Culvert replacement and bank stabilization would cause ground disturbance that would likely contribute to the further establishment of invasive species. The non-native invasive weed species identified do not tolerate overtopping and can be negatively affected by competition for light. Design features that are incorporated into this project such as: planting native plant species on disturbed sites; blocking access to vehicular traffic on decommissioned roads; and washing equipment prior to entering the project area, would mitigate increases in weed populations.

Cumulative Effects

The analysis area for cumulative effects to noxious/non-native invasive plant species is in the Northern Oregon Coast Range approximately 8 miles west of the town of Gaston, Oregon located in

the upper reaches of the Roaring Creek watershed. Examples of forest management activities within the affected area that will create soil disturbance and influence the spread of noxious/non-native invasive plant species are: regeneration harvest, commercial and pre-commercial density management thinning, young stand maintenance, new road construction, road decommissioning, road maintenance, culvert replacements, helicopter landing zones, and off highway vehicle (OHV) trails. Activities that do not necessarily create disturbance but influence the spread of weed seeds are recreational hiking, biking, horseback riding, fishing, and hunting. Other sources of seed dispersal are from wildlife that are either passing through or frequent the area, water and soil movement, natural dehiscence and wind. Many past and present management activities tend to open dense forest settings and disturb soils therefore providing opportunities for widespread weed infestations to occur. Many, if not all of the weed species identified as Priority III (established infestations) on the Oregon Department of Agriculture (ODA) noxious weed list are present throughout the area. Because they are present in the project area, seed is readily available for dispersal. Most non-native weed species are not shade tolerant and will not persist in a forest setting as they compete for light when tree canopies close and light to the under-story is reduced.

2.3.9 Special Status and SEIS Special Attention Plant Species and Habitat

2.3.9.1 Affected Environment

Existing vegetation consists of a 50-70 year-old conifer over-story, scattered pockets of hardwoods, an under-story of common shrubs and scattered populations of grasses and forbs. A comprehensive plant list is located at the Tillamook Resource Area field office. A variety of habitats are represented throughout the project area (substrates, rock, features, elevations, slopes, aspects, water, and topography). Surveys for all lichens, bryophytes, and vascular plants identified as BLM Manual 6840 (Federal Proposed Endangered, Federal proposed Threatened, Federal Threatened, State Endangered, State Threatened, Bureau Sensitive, Bureau Assessment, Bureau Tracking species, and Survey and Manage (S&M) species identified from the 2003 Annual Species Review were conducted in Spring of 2006 and 2007.

2.3.9.2 Environmental Effects Alternative 1: No Action

No affects will occur with the No Action alternative.

2.3.9.3 Environmental Effects Alternative 2: Proposed Action

Several listed species “*Peltigera pacifica*, *Cimicifuga elata* and *Cetraria cetrariooides*” were located within the Commercial Density Management Project area. Both species are “category E” S&M species that require protection of high priority sites. Because high priority sites have not been selected or identified protection of known sites is required (refer to Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage Protection Buffer, and other Mitigation Measures Standards and Guidelines, January 2001, standards and guidelines-12. Design features such as no felling or yarding in or through known sites will mitigate impacts.

Cimicifuga elata is a BLM 6840 Bureau Sensitive species. Current research has indicated that this species responds positively to partial disturbance. Increase in reproduction can be expected with increased amounts of light. Density management thinning will open the canopy allowing more light to access this population and design features such as felled trees requiring full suspension when yarded will mitigate impacting ground disturbance.

Cumulative Effects

The analysis area for cumulative effects for sensitive plant species is in the Northern Oregon Coast Range approximately 8 miles west of the town of Gaston, Oregon located in the upper reaches of the Roaring Creek watershed. Much of the lands within the scope of this project are located behind

locked gates and access is difficult. BLM managed O&C lands are in a checkerboard pattern throughout this part of the coast range. Much of the adjacent ownership is in private holdings and has been observed at an accelerated harvest rate and only requires compliance with the Oregon State forest practices act concerning habitat alteration. Because the forest practices act does not require the private land owners to conduct pre-disturbance surveys and identify sensitive plant sites, a considerable amount of habitat adjacent to the project area is continuously being reduced, therefore increasing the importance of known site protection of sensitive plant species on public lands.

3. PROJECT 2 – Fish Habitat Restoration

3.1 Purpose of and Need for Action

Objectives

By comparing the existing conditions of the landscape in the project area to the management direction contained in the Salem ROD/RMP, the IDT identified a number of specific resource conditions that do not meet the long-term management objectives. The proposed action is designed to modify these conditions, and move towards achieving the management direction described in the ROD/RMP.

The objective of this project is to implement the following management direction from the ROD/RMP, pertaining to protection and restoration of water quality and fish habitat.

- Promote the rehabilitation and protection of at-risk fish stocks and their habitat (p. 27);
- Design and implement fish habitat restoration and enhancement activities in a manner that contributes to attainment of Aquatic Conservation Strategy objectives (p. 27);
- Rehabilitate streams to enhance natural populations of anadromous and resident fish. Rehabilitation measures may include fish passage improvements, instream structure placement to create spawning, rearing and over wintering habitat, and establishment or release of riparian coniferous trees (p. 28).
- Meet Aquatic Conservation Strategy (ACS) requirements by “...closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to ACS objectives and considering short-term and long-term transportation needs” (p. 62);
- Reduce road density by closing roads that are no longer needed for management activities and that are contributing to water quality degradation (p.64).

3.2 Alternatives

3.2.1 Alternative Development

Pursuant to Section 102(2) (E) of NEPA (National Environmental Policy Act of 1969, as amended), Federal agencies shall “...study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.” No unresolved conflicts concerning alternative uses of available resources (section 102(2) (E) of NEPA were identified.

There are no action alternatives to the proposed action in Project 2.

3.2.2 Alternative 1: No Action

The BLM would not implement the fish habitat enhancement project within the proposed project areas at this time. The fish populations would continue to be dependant on ecological processes, such as the natural LWD recruitment regime, that are currently in place. The 1.4 miles of existing road in sections

33 and 34, along with the nine culverts in those roads, would continue to exist and would likely not be maintained on a regular basis.

3.2.3 Alternative 2: The Proposed Action

Roaring Creek has a high potential for protecting and enhancing Upper Willamette River Steelhead populations through the implementation of a stream habitat restoration project. Currently most of the wood in the stream is confined to the upper portions of section 34. Wood that is present in the channel is predominantly composed of conifers less than 10 inches in diameter and 20 feet or less in length. Although wood of this size provides some benefit to instream habitat the proposed project would improve the existing condition to one that more closely meets the ODFW and NOAA Fisheries standards and guidelines.

The proposed action is to implement a fish habitat restoration project that will provide benefit to various fish species (including Upper Willamette Steelhead (ESA listed as threatened), cutthroat trout, western brook and pacific lamprey, and reticulate sculpins), along two portions of Roaring Creek (sections 34 and 35), a tributary to the Tualatin River, approximately 10 miles southwest of Forest Grove, Oregon. The proposal involves in-stream and riparian zone work within a total of approximately 5,925 feet of a 4th order stream – approximately 4,350 feet are located in section 34 and 1,575 feet are located in section 35 (Figure 5). Restoration work analyzed in this EA would occur on BLM-managed lands. The project would involve the placement of up to 60 logs (from 30 trees) with diameters of 20-32 inches and lengths of up to 60 feet utilizing heavy equipment (excavator or spyder) and riparian planting with shade-tolerant tree species. The existing levels of large wood within the proposed project area do not meet either the ODFW standards (48 pieces/mile) or NOAA Fisheries standards (80 pieces/mile). The desired condition is one in which habitat for fish, aquatic life, and riparian-dependent species is improved. Specifically, the riparian zone and active stream channel would contain a greater amount of large woody debris. This would result in more variations in stream velocities which would create greater habitat diversity for fish and other aquatic life. Desired habitat features include interspersed pools, riffles and glides, which promote processes such as a natural sediment regime and nutrient filtering. Logs that extend beyond stream habitats, into riparian zones and/or uplands would increase connectivity for riparian-dependent invertebrate and vertebrate species.

Logs used for the instream portion of the proposed action would come from approximately 15 acres of existing 76-year old stands located along the old Roaring Creek road located in section 34.

3.2.3.1 Connected Actions

Road Decommissioning: In addition to the log placement and riparian planting, approximately 1.4 miles of existing road would be decommissioned. Decommissioning would include removal of nine stream-crossing culverts, ripping compacted soils, reestablishing natural drainage patterns, out-sloping the road surface so that water drains quickly to stable slopes, seeding and/or planting the road surface and adjacent areas of exposed mineral soils, blocking access and/or scattering woody debris on the road surface.

3.2.3.2 Project Design Features

Instream Site Selection and Implementation

- § Sites selected for treatment would be located in areas where the stream has the ability to access the floodplain during high flow events and where it is possible to access the stream with heavy equipment with the least potential of disturbing surrounding vegetation.

- § Project implementation would occur during the ODFW instream work window for this area (July 1 – September 30).
- § All disturbed areas would be de-compacted and replanted with native trees, shrubs and/or grasses.
- § Specific design features incorporated to minimize soil disturbance would be directional falling of trees, one end suspension of trees where possible during yarding, yarding equipment restricted to road prism, and designated stream access points.

Individual Tree Removal for Stream Enhancement

- § No suitable Bald Eagle, Marbled Murrelet, or Spotted Owl nesting trees, trees with existing nests of any species, trees adjacent to trees with nests of any species, or trees greater than 36 inches dbh would be removed.
- § Selected single trees or small groups of trees (2-4 trees) would be: (1) along the periphery of permanent openings (*e.g.*, rights-of-way, rivers etc.), or along the periphery of non-permanent openings (*e.g.*, along plantation edges, along recent clearcuts [less than 40 years old]); (2) single trees may only be removed from the first two lines of trees and would be dispersed along these edges; (3) single trees or small groups of trees (2-4 trees) must be spaced at least one site potential tree height apart and at least one crown width from any trees with potential nesting structure for any listed species (for streamside operations, spacing requirements apply to each bank independently).
- § No trees greater than 32 inches dbh would be removed without prior approval from the USFWS.

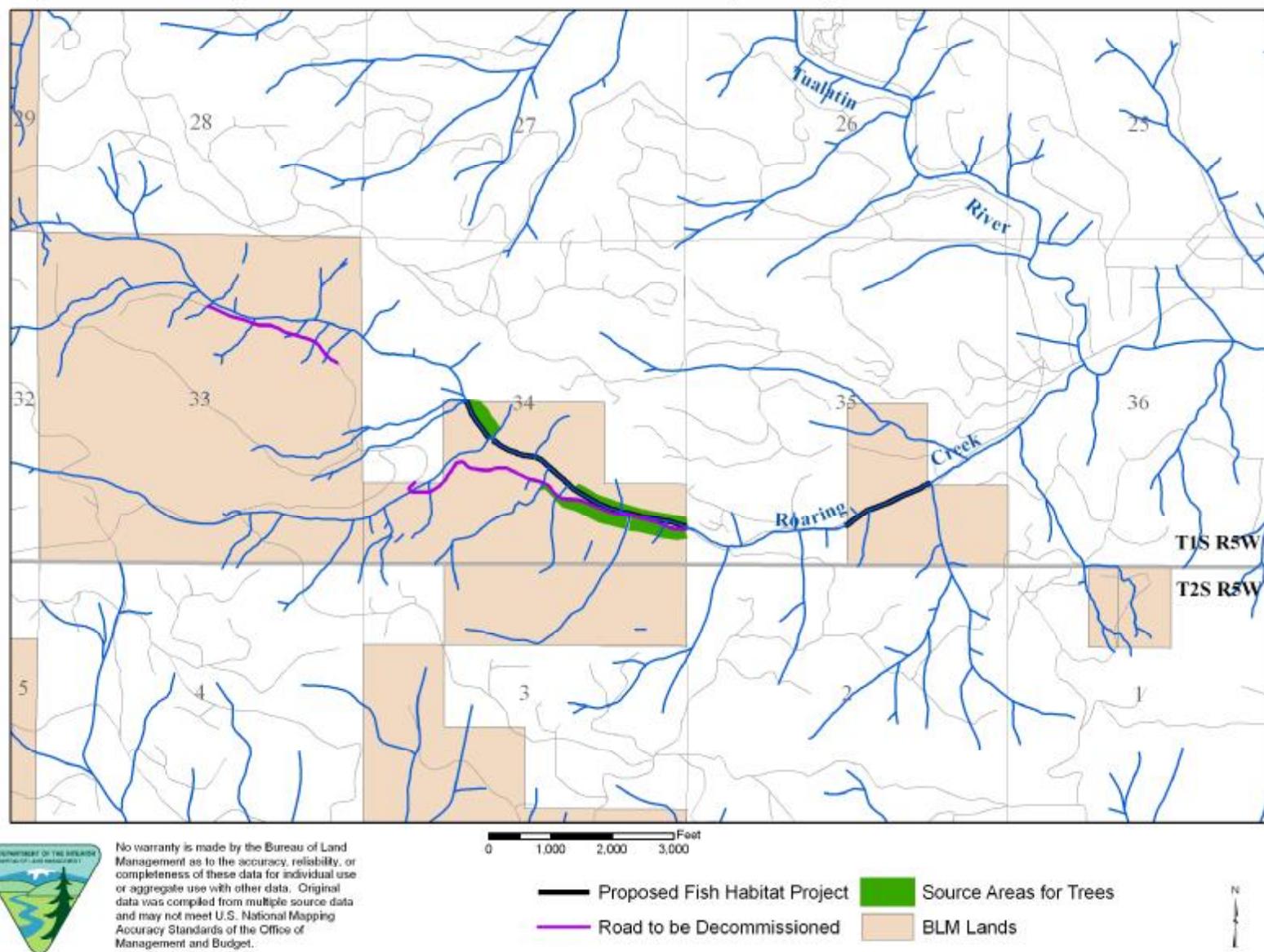
Riparian Planting

- § In an effort to plan for long-term instream wood sources this project would plant the riparian zone with shade tolerant tree species (western red cedar, hemlock, and spruce). In addition, existing conifers struggling underneath the alder-dominated canopy would be released by removing enough of the alders to increase the amount of sunlight reaching the conifers.

Road Decommissioning

- § Decommissioning would consist of removing culverts, decompacting, water barring, seeding or planting with native species, and restricting OHV use. Restricting OHV use may include the strategic placement of boulders, logs, root wads, or other types of earthen barriers.
- § All road decommissioning activities would occur during the dry season (generally June 1 through October 15). All work required in live streams (culvert removal) would be limited to the ODFW instream work window (July 1 to September 30).

Figure 6 - Roaring Creek Fish Habitat Enhancement Project Map



3.3 Affected Environment and Environmental Effects

3.3.1 Forest Vegetation

3.3.1.1 Affected Environment

See description of the affected environment under section 2.3.1 for an overall description of the stands in the project area. The stands proposed for the fish habitat restoration project are outside of the areas planned for variable-density thinning. The majority of the area in section 34 supports a well-stocked 67- to 77-year-old mixed stands of Douglas-fir, western redcedar, grand fir, red alder and bigleaf maple. Hardwoods tend to dominate the floodplain and other seasonally wet areas. Western redcedar and hardwood are filling in opening where Douglas-fir has died standing or has been windthrown as a result of infection by *P. weiri* root disease. The understory shrub layer is generally well-developed, with salmonberry, Indian-plum, elderberry, vine maple and red huckleberry being the most common understory species. Stands along Roaring Creek in the project area in section 35 support well-stocked 67-year-old mixed stands of hardwoods (mostly red alder and bigleaf maple) and conifers (Douglas-fir, western redcedar, and occasionally, grand fir). Approximately 2/3 of the tree species composition consists of hardwoods on the average. There appears to be an abundance of understory and mid-story western redcedar that should be able to respond to openings in the overstory. These stands also support well-developed understories generally dominated by salmonberry, thimbleberry, vine maple, and Indian-plum.

3.3.1.2 Environmental Effects Alternative 1: No Action

Under this alternative, there would be little effect on forest vegetation. The stands would continue on their current developmental trajectories. As the alder-dominated stands approach about 100 years of age, the canopies should begin to deteriorate and the stands would likely become increasingly dominated by shrubs, especially salmonberry, as more light reaches the forest floor.

3.3.1.3 Environmental Effects Alternative 2: The Proposed Action

Removing the 30 widely spaced conifers from the Douglas-fir-dominated stand in section 34 should have a negligible impact on the forest vegetation. Planting and establishing patches of shade-tolerant conifers (western redcedar, western hemlock, and grand fir) within the alder-dominated portions of the riparian zones along Roaring Creek would help to maintain shade over the stream, provide a potential source of large conifer logs for natural recruitment into the stream in the future, and increase the structural and species diversity of these stands. Because of its high susceptibility to *P. weiri* root disease, grand fir would not be included in the planting mixture in or adjacent to disease centers.

3.3.2 Threatened or Endangered Wildlife Species, Habitat and/or Critical Habitat

3.3.2.1 Affected Environment

According to BLM's FOI database, forest stands adjacent to the stream reaches to be treated with the Fish Habitat Restoration Project range in age from about 57- to 77-years-old. Douglas-fir dominates the majority of the stands within the area however western hemlock, western redcedar, grand fir as well as bigleaf maple, black cottonwood and red alder can also be found in some of these conifer-dominated stands. Many of the riparian areas are dominated by hardwoods along the creeks and for various distances up the hillsides.

There are no known special habitats (e.g., talus slopes, cliffs, caves, mines or abandoned wooden bridges) within the vicinity of the proposed project areas.

Northern Spotted Owl - (FT)

Designated Critical Habitat

Critical Habitat is designated by USFWS to provide for the conservation and eventual recovery of the species. The Fish Habitat Restoration project areas are not within Designated Critical Habitat for the spotted owl (USDI 1992).

Proximity to Known Spotted Owl Sites

There are no historic or known occupied spotted owl sites, 100-acre core areas as identified in the NWFP and Salem RMP, or spotted owl RPAs (Reserve Pair Areas) within the Roaring Creek Wildlife Analysis Area, including near any of the Fish Habitat Restoration Project areas. The nearest known spotted owl site considered to be currently occupied is located approximately 6 miles southwest of the project areas, with another located approximately 7 miles to the north. The most recent, available occupancy data at both of these sites suggests they were each occupied by a single spotted owl.

Spotted Owl Surveys

Spotted owl surveys have not been conducted within the area of the Roaring Creek Fish Habitat Enhancement Project. No surveys are required and none are scheduled to be conducted.

Spotted Owl Habitat

There is no spotted owl suitable habitat within 0.25 miles of the shorter stream segment proposed for treatment in section 35. However, located in sections 34 and 3 there is a total of approximately 154 acres of 76-year-old Douglas-fir dominated stands that have been determined to be suitable habitat for the spotted owl; approximately 100 acres of this habitat is within 0.25 miles of the stream segment in section 34 which is proposed for restoration treatments.

Log sources for a portion of the instream restoration work would come from approximately 15 acres of conifer-dominated stands located along the old Roaring Creek road located in section 34. Based upon stand exam data, approximately eight of these acres, those located south of the stream, have been determined to be suitable habitat for the spotted owl albeit of very marginal quality as a result of stand age, and relatively simple stand structure and small QMD. Those log source areas located north of the stream (7 acres) are considered to be spotted owl dispersal habitat.

Marbled Murrelet – (FT)

Designated Critical Habitat

Critical Habitat is designated by USFWS to provide for the conservation and eventual recovery of the species. The Fish Habitat Restoration project areas are not located within marbled murrelet designated critical habitat (USDI 1996).

Proximity to Known Murrelet Sites

With the nearest known occupied marbled murrelet site being approximately 16 miles from the proposed treatment areas, there are no known occupied murrelet sites within the vicinity of the proposed Fish Habitat Restoration Project areas.

Suitable Habitat and Murrelet Surveys

There is no marbled murrelet suitable habitat or individual trees with potential murrelet nesting platforms identified that are located within the immediate vicinity of any of the stream segments proposed for Fish Habitat Restoration or log source areas. However, a small portion of the stream segment proposed for treatment as well as a few acres of the identified potential log source areas

located on the eastern edge of section 34, are approximately 850 feet from a 6-acre patch of marbled murrelet suitable habitat contained within section 3; protocol surveys are scheduled to be conducted within this stand of suitable habitat during 2007 and 2008.

Bald Eagle – (FT)

Proximity to Known Eagle Sites

There are no known bald eagle communal winter roosts within the Analysis Area. The nearest known bald eagle nest is near Henry Hagg Lake, approximately 3.5 miles northeast of the closest stream segment proposed for restoration and/or forested stands identified as potential log sources.

Suitable Eagle Habitat

Based upon characteristics and ages of the forested stands within the area and the fact that there are no “major rivers” (6th order) or “major tributaries” (5th order) within the project areas, no suitable bald eagle habitat was identified within the vicinity of the Fish Habitat Restoration Project. The nearest identified suitable bald eagle habitat is approximately two miles northwest of the project area. Roaring Creek, being considered a 4th order stream, is considered too small to influence the suitability of the surrounding area as habitat for bald eagles.

Dispersed eagle usage may occur throughout the Analysis Area including the project areas wherever habitat suitable to eagles is present; this eagle usage of the area would most probably occur during the late fall or winter months.

3.3.2.2 Environmental Effects Alternative 1: No Action

Under this alternative the BLM would not implement a Fish Habitat Restoration Project within two segments of stream totaling approximately 5,925 feet and no log placement or riparian planting would occur. The plant and animal communities would continue to be dependant on ecological processes such as the natural CWD recruitment regime that is currently in place.

There are no identified cumulative impacts to wildlife or wildlife habitat associated with the No Action Alternative.

Selection of the “No Action” Alternative would be of *NO EFFECT* upon the marbled murrelet, spotted owl, bald eagle and all other species listed under the ESA.

3.3.2.3 Environmental Effects Alternative 2: The Proposed Action

Northern Spotted Owl - (FT)

Designated Critical Habitat The Fish Habitat Restoration Project is not located within designated critical habitat for the spotted owl therefore, the proposed project would be of *NO EFFECT* upon spotted owl Designated Critical Habitat.

Impacts to Known Owl Sites

There are no historic or known occupied spotted owl sites, No impacts to any currently known spotted owl sites would be expected to result from implementation of the Roaring Creek Fish Habitat Restoration Project.

Impacts to Spotted Owls as a result from the Potential for Disturbance

That portion of the project involving trees being felled directly into the stream or moved into the stream channel would adhere to the in-stream work period (July 1 – September 30) however, as designed other noise generating activities may occur during any time of the year including within the spotted owl critical nesting season (March 1 – July 7).

Proposed disruptions within or near suitable habitat with no history of an owl nest site or activity center have the potential to occur within the disruption distance of an active nest site during the breeding season, however the potential likelihood of impacts is considerably less than operations occurring within the vicinity of a known nesting pair of spotted owls. Therefore, potential disturbance resulting from implementation of the Roaring Creek Fish Habitat Restoration Project *MAY AFFECT but is NOT LIKELY TO ADVERSELY AFFECT* spotted owls.

Impacts to Spotted Owl Habitat

Alternative 2 of the Fish Habitat Restoration Project proposes to remove up to a total of 30 individual trees from a total of approximately 15 acres. Approximately eight of these acres identified as log source areas, have been determined to be suitable habitat for the spotted owl - albeit of very marginal quality; the remaining seven acres, those log source areas located north of the stream, are considered to be spotted owl dispersal habitat. Although trees selected for removal would be primarily 20-32 inches DBH, no suitable spotted owl nest trees would be removed. Although small isolated gaps would be created within the canopy as a result of the removal of these trees, impacts to the overall, average canopy cover of the stands are considered to be negligible. The removal of the trees from either the areas identified as spotted owl suitable or dispersal habitat would not be expected to alter the ability of the area to function as either suitable or dispersal habitat.

The primary focus of this project is the restoration of fish habitat although only a portion of any given tree or log would likely be placed in the active stream channel; a appreciable portion of the logs would be expected to be placed in the floodplain / adjacent riparian areas, where it would also be available to benefit a wide range of terrestrial species which utilize or depend upon downed logs including the spotted owl.

Implementation of the Roaring Creek Fish Habitat Restoration Project *MAY AFFECT but is NOT LIKELY TO ADVERSELY EFFECT* the spotted owl based upon the potential minor adverse and beneficial impacts to spotted owl habitat discussed above.

There are no identified cumulative impacts to spotted owl habitat as a result of the Roaring Creek Fish Habitat Restoration Project.

Marbled Murrelet - (FT)

Designated Critical Habitat

The proposed Roaring Creek Fish Habitat Restoration Project would not occur within Designated Critical Habitat for the marbled murrelet therefore would be of *NO EFFECT* upon murrelet Designated Critical Habitat.

Impacts to Known Murrelet Sites

With the nearest known occupied marbled murrelet site being approximately 16 miles from the proposed treatment areas, there are no known occupied murrelet sites within the vicinity of the proposed Fish Habitat Restoration Project areas. No known murrelet sites would be impacted by the proposed action.

Potential for Disturbance

There is no marbled murrelet suitable habitat or identified individual trees with potential murrelet nesting platforms that are located within the immediate vicinity of any of the stream segments proposed for fish habitat restoration or log source areas. However, a small portion of a stream segment proposed for treatment as well as approximately 3 acres of the identified potential log source areas are located within 0.25 miles of a 6-acre patch of marbled murrelet suitable habitat;

protocol surveys are scheduled to be conducted within this stand of suitable habitat during 2007 and 2008.

Based upon the fact that all the suitable or potential murrelet habitat within a minimum of approximately 0.25 miles of the proposed habitat restoration treatment area and log source areas would be surveyed to protocol and found to be unoccupied prior to implementation the project, the Fish Habitat Restoration Project would be of *NO EFFECT* upon the marbled murrelet as a result of disturbance.

Note: Should the scheduled murrelet surveys result in the identification of an occupied murrelet site within the vicinity of the proposed treatments, the project would be modified to meet the standards and guides of the NWFP and Salem District RMP. This would include protecting all contiguous existing and recruitment habitat for marbled murrelets (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years) within a one-half mile radius of any site where the birds' behavior indicates occupation; this could including a change in the Land Use Allocation to (unmapped) LSR as appropriate. This "new information" would be documented and addressed in the Final Decision documentation for the Roaring Creek Projects. If necessary, interagency Level 1 Team (terrestrial sub-group) for the North Coast Province - including USFWS, would be informed to assure compliance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended.

Impacts to Murrelet Habitat

No tree which is currently, potentially suitable as a murrelet nest tree would be impacted by the Fish Habitat Restoration Project. The majority of the trees selected for use in the Restoration Project would include those trees with relatively little crown development. The average canopy closure of the stands identified as log sources would be negligibly impacted as an estimated 30 trees would be removed over an area approximately 15 acres in size. The Fish Habitat Restoration project would be of *NO EFFECT* upon the murrelet as a result of habitat modification.

Bald Eagle - (FT)

Impacts to Known Eagle Sites

There are no known bald eagle communal winter roosts within the Analysis Area. If a new bald eagle nest or roost is discovered, any project activity within 0.25 mile or 0.5-mile sight distance would immediately be evaluated by the unit wildlife biologist for potential effects on bald eagles and mitigated to prevent disturbances. No impacts to any known eagle sites would be expected to result from implementation of the Roaring Creek Fish Habitat Restoration Project.

Potential for Disturbance

Although dispersed eagle usage may occur throughout the Analysis Area wherever suitable eagle habitat is present, there is no identified suitable eagle habitat within or near the areas of the proposed Fish Habitat Restoration Project. It is unlikely that project implementation would disturb any bald eagles; should the project displace dispersed foraging, perching or resting eagles, it would be expected that these displaced birds would temporarily relocate to other areas containing suitable habitat and lower levels of activity.

It has been determined that the proposed Fish Habitat Restoration project would be of *NO EFFECT* upon the bald eagle as a result of an increased potential for disturbance.

Impacts to Eagle Habitat

No suitable bald eagle habitat was identified within the vicinity of the Fish Habitat Restoration Project.

Since the proposed project is designed to benefit anadromous fish production, which is a primary food source for eagles within the region, there is potential for indirect beneficial impacts to bald eagles through improved fish stocks resulting in better eagle foraging opportunities. These beneficial impacts are, however, considered to be negligible.

Based upon the scale and nature of the proposed treatments and the habitats impacted, the proposed Fish Habitat Restoration Project has been determined to be of *NO EFFECT* upon the bald eagle based upon the potential for habitat modification.

3.3.3 Special Status and SEIS Special Attention Wildlife Species and Habitat

3.3.3.1 Affected Environment

Mollusks – (BS) and/or Survey and Manage

The proposed Fish Habitat Restoration Project areas contain and/or are directly adjacent to suitable habitat for seven species of mollusks identified as Bureau Sensitive on the Bureau's Manual 6840 Special Status Species List; two of these species are also Survey and Manage Species

However, Survey and Manage pre-project surveys, including mollusks surveys, are currently not required for these treatment areas due to a Court order exempting "riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions" from pre-project S&M surveys. Portions of the identified log source area in section 34 were surveyed for mollusks, primarily in conjunction with the Density Management Project; no S&M mollusk species or species identified as Bureau Sensitive on the Bureau's Manual 6840 Special Status Species list were found.

Columbia Torrent Salamander - (BS) Bureau Sensitive

The Columbia torrent salamander is strongly associated with the splash zone directly adjacent to permanently flowing streams and seeps. Portions of the Fish Habitat Restoration Project areas contain and/or are in direct proximity to suitable torrent salamander habitat. Pre-project surveys conducted for the Roaring Creek Projects resulted in six Columbia torrent salamanders being located. A Columbia torrent salamander was located in a small side-channel to Roaring Creek on the eastern edge of section 34, directly adjacent to the stream segment proposed for Fish Habitat Restoration work. This species is assumed to be present within and near the project area where suitable habitat is present.

NWFP Bats

The NWFP and Salem District RMP identify five species of bats that would benefit from additional habitat protection. Four of these five species have potential of being located within or near the proposed action areas. These species include the fringed myotis, long-eared myotis, long-legged myotis, and the silver-haired bat. All of these bat species are known to inhabit mature and immature coniferous forest and may forage near riparian areas, open areas, and along forest edges while utilizing large hollow trees for roosting, hibernating, and maternity colonies.

There are no known bat roosting or hibernaculum sites within the project area. Surveys for these species are required under the NWFP if caves, mines, or abandoned wooded bridges and buildings are within or near the project area. None of these habitat types or structures are within or near the project area therefore no bat surveys are required. No bat surveys are scheduled to be conducted within or near the Roaring Creek Fish Habitat Restoration project areas.

Townsend's Big-Eared Bat - (BS)

In addition to the bat species identified within the NWFP, one species of bat, Townsend's big-eared bat, is covered by the Bureau's Special Status Species Policy. Townsend's big-eared bats are seldom abundant but are known to occupy a variety of habitats. In western Oregon, these bats are associated with coniferous forests, but they are also considered characteristic dwellers of caves, abandoned mines, and buildings. No caves, abandoned mines or buildings are known to be located within the vicinity of the proposed action. Some of the more open forested and riparian habitats within and near the proposed treatment units could function as foraging habitat and it is possible although rather unlikely that this species of bat could be encountered within or near the proposed project area.

Red Tree Vole – (BS) and Survey and Manage

Portions of the proposed Fish Habitat Restoration project areas (log source sites) may contain suitable habitat for the red tree vole. However, Survey and Manage pre-project surveys, including red tree vole surveys, are currently not required for these treatment areas due to a Court order exempting “riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions” from pre-project S&M surveys. (See Section 1.2 of the Roaring Creek Projects EA - Conformance with Land Use Plans, Policies and Programs)

3.3.3.2 Environmental Effects Alternative 1: No Action

Under this alternative the BLM would not implement a Fish Habitat Restoration Project within two segments of stream totaling approximately 5,925 feet and no log placement or riparian planting would occur. The plant and animal communities would continue to be dependant on ecological processes such as the natural CWD recruitment regime that is currently in place.

There are no identified cumulative impacts to wildlife or wildlife habitat associated with the No Action Alternative. Selection of the “No Action” Alternative would not be expected to adversely impact (result in a loss in population viability or elevate their status to any higher level of concern) any of the wildlife Special Status, or other Species of Concern discussed above.

3.3.3.3 Environmental Effects Alternative 2: The Proposed Action

Other Special Status Species

Primarily as a result of the nature and scope of the proposed project (include incorporated design features to minimize the potential for adverse impacts) as well as the nature of the habitats impacted, implementation of the Fish Habitat Restoration Project would not be expected to result in the loss of population viability for any Special Status Species that may occur in the project area, or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

The project involves the addition of down log and trees into the active stream channel and adjacent riparian areas. Overall, a wide range of species including Special Status Species which utilize or depend upon downed logs would be expected to benefit from the proposal. In addition to those species discussed below, other species such as the clouded salamander and pileated woodpecker (both Bureau Tracking species) would be expected to benefit from implementation of the Fish Habitat Restoration Project.

From a cumulative impacts perspective, the Fish Habitat Restoration Project would help offset some of the short- and/or long-term adverse impacts to existing and future in-stream and riparian habitats resulting from the various past, present and foreseeable timber harvest operations within the watershed. These impacts include impacts to existing and future,

natural LWD and down log recruitment processes. The Fish Habitat Restoration Project would enhance the current LWD levels within the watershed.

Mollusks- (BS) and/or Survey and Manage

Project design features include measures to reduce soil disturbance; this would also serve to help reduce impacts to mollusk habitat. Due to the nature of the project, minor, localized adverse impacts to Special Status mollusk species or their habitats are expected to result from the proposed Fish Habitat Restoration Project. Should any of the S&M mollusk species be located within a riparian area proposed for treatment or log source area, it would not be expected that disturbance to the area would result in a threat to their maintenance or enhancement at the site. Additionally, the project would not be expected to result in the need to elevate any special status mollusk species' to any higher level of concern including the need to list under the ESA.

Columbia Torrent Salamander - (BS) Bureau Sensitive

The Columbia torrent salamander is strongly associated with the splash zone directly adjacent to permanently flowing streams and seeps. Pre-project surveys discovered one individual in a small side-channel to Roaring Creek on the eastern edge of section 34, directly adjacent to the stream segment proposed for fish habitat restoration work. This species is assumed to be present within and near the project area where suitable habitat is present.

There is potential for the instream portion of this project to adversely impact a limited quantity of suitable torrent salamander habitat. These adverse impacts are considered to be short-term and negligible based upon the nature of the project, minor scope of the expected impacts to habitat quality and small portion of the available habitat to be impacted. In the long-term, any CWD additions to riparian areas containing suitable salamander habitat would be viewed as beneficial in that it would serve to add structural diversity and improve and/or increase the micro-habitats available for this species.

The Fish Habitat Restoration Project also includes some road decommissioning including the removal of 9 existing culverts that are located on live streams. There is potential that the removal of these culverts could impact a few individual animals and very localized stretches of suitable torrent salamander habitat. Project design features would help minimize the potential for adverse impacts. It would be expected that should there be any adverse impacts upon torrent salamander habitat they would be negligible and short-term as the impacted areas would rapidly recover.

As a result of the nature and scope of the proposed project, the expected impacts, and the amount of suitable torrent salamander habitat present that would not be impacted, implementation of the Action Alternative (Alt 2) of the Fish Habitat Restoration Project would not be expected to result in the loss of population viability for Columbia Torrent Salamanders or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

Bats (including NWFP bats and the Townsend's Big-Eared Bat)

There are no known bat roosting or hibernaculum sites within the project area.

Bats are known to forage near riparian areas, within open areas, and along forest edges. The Fish Habitat Restoration project would be expected to a somewhat minor degree, improve the quality of bat habitat. This would result from potentially creating or maintaining small openings in the forest canopy. Additionally, downed logs and trees placed within riparian areas augment existing CWD levels thereby potentially providing additional night-time roost sites for use by bats foraging along and over Roaring Creek.

Red Tree Vole - (dusky sub-species) - (BS) and Survey and Manage

Potential adverse impacts to tree voles and their habitat are minimized by the inclusion of the project design features. Impacts to individual red tree voles possibly occupying the proposed project areas would be expected to be very unlikely as a result of implementing the proposed Fish Habitat Restoration Project. Based upon the nature of the proposed Fish Habitat Restoration Project including the fact that a very small portion of the available habitat would be impacted, the project would not be expected to impact the current or future suitability of the treated stands for use by red tree voles.

Roosevelt Elk and Black-Tailed Deer

It is expected that implementation of the Roaring Creek Fish Habitat Restoration project would temporarily displace individual deer and elk as they react to the disturbance created by project implementation. This would not impact the health of the populations based upon the limited length of time of the disturbance and the fact that other, relatively undisturbed suitable habitat is present within the vicinity of the proposed action. Overall, based upon the nature of the project, the impacts of the proposed Fish Habitat Restoration project upon deer and elk habitat are considered to be negligible.

3.3.4 Soils

This section discusses soil on-site effects. Off-site soil effects including sediment delivery and water runoff are discussed in the Water Resources (Section 2. 3.5).

The analysis area includes all lands that would be disturbed as result of acquiring and placing logs into Roaring Creek and decommissioning 1.4 miles of existing road.

The main soil resource concern with this project is how the proposed actions or lack of action will affect soil productivity and soil erosion. Planting riparian trees would result negligible soil disturbance and no loss in long-term soil productivity and therefore was not be evaluated.

3.3.4.1 Affected Environment

The project area lies in a narrow, moderately deep, V-shaped valley drained by Roaring Creek. The dominant soils in the project area are the Olyic and Pervina series on moderate to steep (20 to 60%) hillslopes and unclassified colluvial and alluvial soils on nearly level to gently sloping (2 to 8%) terraces and floodplains adjacent to Roaring Creek. The Olyic and Pervina series are deep, fine loamy, well drained soils with moderate fine textured surface soils that are sensitive to compaction and displacement. The colluvial and alluvial soils are very deep, loamy textured and are moderately well drained to poorly drained. These soils have had little recent disturbance and show no indication of soil quality impairment. Important soil ecological processes such as nutrient cycling, organic matter accumulation and decomposition, and soil bioturbation are improving the soil health.

The Roaring Creek Road segment is compacted and surfaced with aggregate. It has several small stream crossings that have failed. During large storm events, water flows down and across the roadbed and ditches increasing road and hillslope erosion. The "north" road in Section 33 is compacted and surfaced by native soil. It is located on a large rotational/earthflow slide. The middle portion of the road has slumped badly and is eroding.

3.3.4.2 Environmental Effects Alternative 1: No Action

There would be no direct effects to soil resources from the proposed action. There would be no new soil disturbance and erosion from project actions. Current conditions and trends as described in the

Affected Environment (Section 3.3.4.1) would continue. Erosion at failing stream crossings, poorly maintained ditches, and portions of the road segments would continue.

Cumulative Effects

Since there would be no direct effects under this alternative, there would be no incremental cumulative effect to long-term soil productivity or soil erosion. These soils show little evidence of past disturbance and show no indication of soil quality impairment. Current soil conditions and trends would continue.

3.3.4.3 Environmental Effects Alternative 2: The Proposed Action

Under the Proposed Action, up to 30 trees with diameters of 20 to 32 inches would be directionally felled and pulled by equipment downhill, approximately 20 to 150 feet, pulled over Roaring Creek Road, and across a stream terrace and placed into Roaring Creek. To minimize potential soil impacts, low ground pressure machines would be utilized. Most of the work would probably be done with a Spyder Hoe, which is a light weight machine (<4 psi ground pressure) with independent drive to all four legs capable of making six foot vertical steps and operating on 100% slopes. It is anticipated that about 6 new trails, totaling approximately 3,000 linear feet, would be needed to access the two stream reaches. Areas compacted by equipment would be decompacted by an excavator.

Soil Productivity

The proposed action would result in minor, dispersed soil disturbance. Most of the severe soil disturbance would occur in narrow strips when trees are pulled downslope and across the terrace. This action will mix and displace the top soil and organic material with the subsoil into lateral berms and compact the subsoil. Logs would be partially cushioned by existing down logs and large woody debris. But there would probably be little or no suspension of the leading ends of the logs. The total amount of severe soil disturbance is expected to be less than ½ acre across over 30 acres. No loss in site productivity is expected.

Subsoiling 1.4 miles of road would help de-compact the soil and increase infiltration. Over time, there would be some recovery in soil productivity on approximately 2.8 acres.

Considering that severe soil disturbance would be limited to less than ½ acre and partial soil recovery on 2.8 acres, the proposed action would contribute a negligible incremental cumulative effect to soils at the project area.

Soil Erosion:

Pulling trees across the ground would expose mineral soils and likely create ruts. This action would slightly increase the risk of soil erosion, especially on steep slopes. To minimize erosion, gouged soils on steep and sensitive sites would be water barred.

Road decommissioning 1.4 miles of existing road would increase the risk of soil erosion. Increases would be slight and short-term because road segments are gently sloping and the surface would be quickly revegetated. Subsoiling would increase infiltration and restore surface drainage. In the long-term, it would reduce surface erosion and the potential for slope and drainage failures.

Cumulative Effects

Because the project action would result in minor, dispersed soil disturbance and no measurable loss in soil productivity, no cumulative effects in long-term productivity are expected. Soil left bare from by project activity would be covered by vegetative cover within a year or two. Current soil conditions and trends would continue.

3.3.5 Water Resources

This section discusses water resources effects. On-site soil effects of soil erosion are discussed in the Soil Resources (Section 3.3.4).

The analysis area for direct and indirect effects is the project site and all of the watersheds and subwatersheds in which timber harvest, fuels reduction, and road activities in which project activities occur.

The main water resources concern with this project is how the proposed placement of LWD would affect channel stability and structural complexity, sediment and turbidity, water temperature, and dissolved oxygen.

3.3.5.1 Affected Environment

The project lies within a narrow, V-shaped forested valley and is drained by Roaring Creek, a 4th order stream flowing generally east. The reaches proposed for treatment have Rosgen B3 and B4 type channels. They vary from meandering, low gradient (1 to 2%) channels with fine sands and gravels substrate in moderately restrained valleys with small floodplains to moderately incised, moderate gradient channels (2 to 6%) with gravel and cobble substrate. According to the 2006 ODFW aquatic inventory, channel types are dominated by rapids, large wood debris (LWD) is moderate. Only a small fraction of that volume consist of key large wood (24" or greater in diameter).

Past timber harvest in the Roaring Creek drainage has accelerated erosional processes and has removed large wood from the riparian zone. Compared to reference conditions, the stream is high in fine sediment and deficient in structural elements (LWD). According to the watershed analysis, most small channel streams within the watershed are severely deficient in large wood. State and private land owners are expected to continue to harvest trees within riparian areas in the watershed. No known LWD placement projects are known within the watershed outside of this project.

Potential for LWD instream recruitment within the project area is estimated be low to moderate based upon the surrounding topography and age of trees (60 to 80 year old conifers). The primary water quality concern for the project stream is excess fine sediment. The main source of fine sediment inputs into the project area appears to come from deep-seated mass wasting. Most of the human caused sediment is coming from poorly maintained native surface roads, especially during winter use. The primary beneficial use that could potentially be affected by the proposed action is cold water fisheries.

Roads proposed for decommissioning include approximately 1 mile Roaring Creek Road (2 acres) in Section 34 and 0.4 miles (0.8 acres) of an unnamed road ("North Road") in the northern portion of Section 33. About ½ of the road segment is hydrologically connected to Roaring Creek. The road has 4 intermittent and 2 perennial stream-crossing culverts. Visible turbidity has been

observed in the road ditch and stream crossing in the winter time. The road in Section 34 is located on a slowing moving earthflow. Parts of the “North Road” are badly slumping.

3.3.5.2 Environmental Effects Alternative 1: No Action

There would be no direct effects to water resources from the proposed action. Current conditions and trends as described in the Affected Environment (Section 3.3.5.1) would continue. High stream velocities would continue to scour substrate and stream banks transporting substrate and organic material downstream. The current low levels of LWD in channels would slowly decrease further as more logs rot, break apart, and move downstream. Over time (40+ years), trees near streams would grow and drop into streams and begin to reverse these conditions. Gradually channels would become more stable and the channel morphology would become more complex and diverse. The quantity and quality of pools would increase.

Sediment would continue to be routed to streams from Federal, state, and private lands. The Roaring Creek Road segment and the “north” road would continue to transport elevated levels of sediment into Roaring Creek. In the long-term, some road segments are likely to fail, potentially sending large sediment loads into streams.

Cumulative Effects

Under the No Action Alternative, there would be no increase in sediment and turbidity as the result of placing log structures and decommissioning roads. However, the current low levels of LWD as result of past logging actions would continue to decrease until trees near streams would grow and drop into streams and begin to reverse these conditions (approximately 40+ years). Management actions by other landowners above the project area are located far upstream and unlikely to supply additional large wood to this area. There are no other BLM plans in the project area for the reasonably foreseeable future.

3.3.5.3 Environmental Effects Alternative 2: The Proposed Action

Channel Stability and Structural Complexity

The placement of log structures in stream reaches would help increase channel stability and structural complexity. The following general effects are expected. There would be a reduction of stream energy and velocities, a decrease in the local slope of channels, and an increase streambed roughness. During the first year or two after project implementation, there would be some minor erosion and channel adjustments (decrease channel stability). Over time, the placed instream structures would trap more wood and sediment moving downstream. Consequently, the channel elevation would rise (aggrade) and the channel would connect to a larger floodplain area. Channel stability would increase and bank erosion would decrease. There would be more diversity of channel types including a greater number and quality of pools.

The proposed riparian planting would in the long-term (40+ years) produce an additional source of LWD. Future LWD recruitment would not be substantially affected by the project action, because most trees proposed for the LWD placement would come far away from the stream channel. Trees would come from fully stocked stands.

Removing approximately 4 intermittent and 2 perennial stream crossing culverts would reduce the risk of chronic and catastrophic failure at these sites and it would help restore the physical integrity of stream channels. The removal would cause some minor disturbance within channel beds and

streambanks. During the first few years after removal there will likely be some minor channel adjustments. Overtime, this action would improve stream channel form and function.

At the project level, the placement of LWD in stream channels and removing culverts would have a beneficial effect cumulative effect by increasing channel stability and structural complexity and improving aquatic habitat conditions.

Sediment and Turbidity

Keying logs into streambanks with heavy equipment would disturb soils and would likely result in short-term increases in turbidity and fine sediment. The following Project Design Features (PDFs) and Best Management Practices (BMPs) would be employed to minimize sediment delivery: Instream work would be restricted to low summer flows; The number of access trails would limited to the amount needed; Equipment would be kept off streambank and out of stream channels as much as possible; Logs would be placed in such a manner that direct flows are not directed onto unstable banks.

During log placement there would be localized increases in turbidity (mostly pulses) and small amount sediment generated. Visible turbidity would not be expected to extend beyond 2 hours per day. Due to the low summer flows, most of that sediment generated by log placement would travel short distances downstream before being stored in the channel. The fine sediment stored in stream channels would be mobilized during the following first winter high flow, and would not become embedded in gravels.

Most of the increases in turbidity and fine sediment from log placement would occur from increased bank and bed erosion, especially during winter storm events. Over approximately one to three years, the streambank and channel would adjust until an equilibrium state in which the input and output of mass and energy to and from a specific reach are equal is reached. The additional logs would increase roughness and increase the stream's capacity to store sediment and organic matter. Overtime, bed and bank scour and sediment deposition and transport would return to background levels and water quality would improve.

There are no known studies which have quantified sediment generated from in-stream projects. The amount of sediment generated would vary with amount of soil disturbance, how much equipment is in or out of the channel, the sensitivity of the streambank to erosion, and timing and magnitude of precipitation events before disturbed areas are fully stabilized.

Based upon field observations on other in-stream restoration projects, we estimate that the placement of logs would generate about 0.25 cubic yards of sediment per restoration site during project implementation, or a total of approximately 2.5 cubic yards of sediment. The total amount of sediment generated over the first three years is estimated to be 3 cubic yards per restoration site, or a total of approximately 30 cubic yards of sediment.

Decommissioning approximately 1.4 miles of road would result in short-term (< 3 years) localized increase in turbidity and sediment. Most of the increases would come from removing the stream crossing culverts. Implementing PDFs and BMPs such in-stream work restrictions, diverting water around project area, and revegetating bare slopes would reduce sediment outputs. The amount of sediment generated from replacing and removing culverts replacement is estimated to average about one cubic yard for each removal. Since the culvert removal would occur during the dry season there should be very little downstream movement of sediment. Most sediment would move downstream in subsequent high stream flows.

In the long-term, decommissioning these roads would help restore the natural hydrologic flow paths, sediment storage, and routing processes on Roaring Creek. In addition it would reduce the risk of future road failures.

In conclusion, project activities would disturb the ground and cause short-term (< 3 years) increases in sediment and turbidity. Over the long-term (>3 years), current conditions and trends in turbidity and sediment regime would be maintained or slightly improve at under the proposed action at the project level as more sediment is trapped by LWD and erosion decreases on roads.

Water Temperature

Nearly all trees that would be felled are more than 60 feet away from a stream channel. The few trees taken within 60 feet of the channel would come from fully stocked tree stands and/or areas where the aspect would preclude appreciable solar heating. The placement of logs in stream channels would provide additional shading. In the long-term (>40 years), riparian planting would also provide additional streamside shade. In conclusion, the proposed and connected actions are unlikely to affect water temperature.

Dissolved Oxygen

Project streams are cold, well-aerated forested streams that are relatively resistant to management actions that could affect DO concentrations.

The primary way forest management activities can affect DO is by increasing water temperature. Project actions are not expected to affect stream temperature. Forest management activities may also increase DO concentrations by greatly increasing organic matter and sediment. Organic matter additions would consist mostly of tree boles which will decay slowly. Most of the sediment generated by the project activities would move out of the area during high flows. In conclusion, the proposed and connected actions are unlikely to affect DO concentrations.

Cumulative Effects

The proposed action is unlikely to have a measurable affect on streamflows, temperature, DO concentrations, or water temperature. It is therefore unlikely to contribute to cumulative effects to these parameters.

Because the proposed and connected actions would likely add sediment and alter the channel morphology in project stream reaches, the proposed action has the potential to result in cumulative effects. The analysis scales for sediment deposition are the project site and the stream downstream to the confluence of Tualatin River (approximately 0.6 miles). The analysis scales for channel morphology is for the entire length of Roaring Creek (approximately 5.14 miles) and 6th field watershed and larger. These scales were chosen because their effects resulting from the project action combined with other past, present, and reasonably foreseeable actions could overlap in time and space.

The greatest potential for cumulative effect for sediment would occur during the first winter when sediment generated from this project combined with sediment from other sources (human-related and natural), move downstream and overlap. Most of the sediment is expected to be trapped in channels behind placed log structures. Sediment not trapped by log structures is expected to dissipate with additional flows and become unmeasureable and inconsequential when it reaches the Tualatin River. Most of the sediment increases would occur within the first year or two after project

implementation. Over the long-term (> 3 years), sediment and turbidity and sediment conditions and trends would be expected to return to current or slightly below (reduction in road sediment from road decommissioning) current levels.

The project by design will alter channel morphology at the project site to increase aquatic habitat. At the total stream scale, the project action would increase aquatic diversity on 1.12 miles of the 5.14 stream miles and have a notable affect. At the 6th watershed scale and larger, the effect would not be noticeable. Over the long-term, placed logs would continue to trap more wood and sediment and streamside trees would continue to grow in size and fall into the channel. The channel complexity would continue to increase and the channel stability would continue to strengthen.

3.3.6 Threatened or Endangered Fish Species or Habitat

3.3.6.1 Affected Environment

In 2006 the BLM contracted with the Oregon Department of Fish and Wildlife to conduct an Aquatic Habitat Inventory of Roaring Creek. This inventory started at the Roaring Creek – Tualatin River confluence and continued up to the headwaters, a distance of 8274 meters (5.14 miles). This survey was divided into 9 reaches that were delineated by valley morphology, land use, or stream gradient. The proposed fish project would occur entirely within reach 3 along two portions of Roaring Creek (sections 34 and 35), a tributary to the Tualatin River, approximately 10 miles southwest of Forest Grove (Figure 5). This reach is 1.6 miles in length and is dominated by rapids with very little pool habitat available for use by UW steelhead adults and juveniles. The riparian zone is predominantly composed of young trees and second growth timber. Although the volume of wood is moderate (ODFW analysis) the size of the wood is small and easily mobilized during high stream flow events. The number of key pieces of wood ($\geq 12\text{m} \times 0.6\text{m}$) is only 15/mile, far below both the ODFW standard of 48/mile and NOAA fisheries standard of 80/mile.

3.3.6.2 Environmental Effects Alternative 1: No Action

There would be direct effects T & E fish from the no action alternative. Current conditions and trends as described in the Affected Environment (Section 3.3.5.1) would continue. High stream velocities would continue to scour substrate and stream banks transporting substrate and organic material downstream. The current low levels of LWD in channels would slowly decrease further as more logs rot, break apart, and move downstream. The current trend of less wood in the stream channel would result in fewer pools overall and fewer of the quality pools needed by T & E species.

Sediment would continue to be routed to streams from Federal, state, and private lands. The Roaring Creek Road segment and the “north” road would continue to transport elevated levels of sediment into Roaring Creek. In the long-term, some road segments are likely to fail, potentially sending large sediment loads into streams. Increased quantities of sediments negatively effects spawning gravels essential to the long term spawning and survival success of T & E species in this watershed.

Over time (40+ years), trees near streams would grow and drop into streams and begin to reverse these conditions. Gradually channels would become more stable and the channel morphology would become more complex and diverse. The quantity and quality of pools would increase.

Because this no action alternative would not alter current condition or trends, when combined with other past, present, and reasonably foreseeable actions, there would be no incremental cumulative effect to hydrology or water quality.

Cumulative Effects

Because the no action alternative would not alter current condition or trends, when combined with other past, present, and reasonably foreseeable actions, there would be no incremental cumulative effect to essential fish habitat. It is anticipated that current trends occurring on non-federal lands in the watershed would continue, and combined with the no action alternative would result in steady declines of LWD in the stream channel until federal forest trees mature and begin falling into the stream channel.

3.3.6.3 Environmental Effects Alternative 2: The Proposed Action

The proposed action is to place up to 60 logs (from 30 trees) with diameters ranging from 24 to 32 inches in selected locations along BLM managed sections of Roaring Creek. The proposed action would be accomplished using a spyder for wood placement. In addition to the large wood placement, the riparian zone would be planted with a mix of conifers for future large wood recruitment to the stream channel. The addition of trees to identified stream reaches, riparian zones but not including upland areas within the Roaring Creek restoration area is anticipated to directly alter the current condition of the aquatic system. These LWD additions within the riparian zone or directly to the stream channel would provide a benefit to the matrix indicators for LWD, pool area, pool quality, and refuge habitat. In addition, substrate conditions should improve due to the addition of these channel forming elements (trees). There are effects anticipated from planned LWD additions to stream channels where threatened species are located. These effects would range from an aversion response to the potential of mortality for a few individuals. When these trees are placed these species may move away, either from a tree falling in the water, or as a result of short pulses of generated sediments.

Effects to fish from the proposed action may include an aversion response and/or the chance of direct mortality. While this action may elicit either a behavioral response and/or direct mortality on a few individual fish it would have no effect on the long term sustainability of the population as a whole.

Effects to substrate as a result of this action are not anticipated to occur until streams in the area rise to or near to bankfull stage. These effects are anticipated to be both beneficial and adverse. As the streams in the area begin to rise during large winter storm events, sorting and routing processes of instream substrates would begin to occur, which would produce small pulses of sediment. However, with the addition of LWD the transport of gravels within this stream segment would change. The greatest change anticipated is the trapping and aggregation of the stream channel or the formation of pools adjacent to where LWD is added which would increase fisheries habitat.

With the implementation of this project adverse impacts may occur to individual threatened species. The potential loss of a few individual fish would not elevate concern for these species, their status or contribute to the need to change their listing from threatened to endangered under the Endangered Species Act.

Road Decommissioning

In section 34 there are six culverts that would be removed when the road is decommissioned. These culverts range from about 110 – 1,607 feet from UW steelhead. Four of these crossing are located on first order streams and one is located on a small 2nd order stream. They all have shallow fill, and would probably be dry or nearly dry when they are removed during the ODFW instream work period. There is one culvert located on a 3rd order stream that has about 20 feet of fill, is located near the upper extent of cutthroat trout distribution and is about 1,607 feet from Upper Willamette steelhead. This stream channel would have water running in it when the culvert is removed but best

management practices such as de-watering the project area and implementing during the ODFW instream work period would keep the amount of sediment released from this removal (< 1cu yard) at levels that would have no measurable impact on Upper Willamette steelhead in Roaring Creek. There are no anticipated effects to ESA species as a result of decommissioning the ‘North Road’ located in section 33. This is located on a flat bench with only three small (<18 inches) culvert crossings needing removal. The topography below these crossings consists of a series of flat benches and old skid roads that would effectively trap and store any small amount of sediment released during removal and after the first rains following implementation. If any sediment were to reach Roaring Creek as a result of decommissioning the ‘North Road’, the amount would be small and immeasurable.

Cumulative Effects

The proposed LWD stream restoration project would improve the current condition of the stream channel and maintain it until such time as natural LWD recruitment from federal forest lands occurs. The current trend on surrounding private forestlands is timber harvest according to the provisions contained in the Forest Practices Act. This may result in little or no conifer retention in the riparian zone on private timberlands that would contribute to future LWD inputs to the stream channels.

The cumulative effects of the proposed road decommissioning project would result in a net decrease in road density in the watershed of 1.4 miles. This is an improvement over the current condition and trends occurring on surrounding private timberlands.

3.3.7 Fish Species with Bureau Status and Essential Fish Habitat

3.3.7.1 Affected Environment

When the Magnuson-Stevens Act (MSA) of 1976 was re-authorized in 1996, it directed Regional Fishery Management Councils to identify Essential Fish Habitat (EFH) for commercial fish species of concern. Effects analysis contained here address potential effects to EFH (i.e., effects to coho salmon habitat). Essential Fish Habitat or EFH is defined as ‘those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10))’. There are no fish species with bureau status in the proposed project area.

In 2006 the BLM contracted with the Oregon Department of Fish and Wildlife to conduct an Aquatic Habitat Inventory of Roaring Creek. This inventory started at the Roaring Creek – Tualatin River confluence and continued up to the headwaters, a distance of 8,274 meters (5.14 miles). This survey was divided into 9 reaches that were delineated by valley morphology, land use, or stream gradient. The proposed fish project would occur entirely within reach 3 along two portions of Roaring Creek (sections 34 and 35). This reach is 1.6 miles in length and is dominated by rapids with very little pool habitat available for use by coho salmon adults and juveniles. The riparian zone is predominantly composed of young trees and second growth timber. Although the volume of wood is moderate (ODFW analysis) the size of the wood is small and easily mobilized during high stream flow events. The number of key pieces of wood ($\geq 12\text{m} \times 0.6\text{m}$) is only 15/mile, far below both the ODFW standard of 48/mile and NOAA fisheries standard of 80/mile. Restoration work analyzed in this EA would occur on BLM-managed lands

3.3.7.2 Environmental Effects Alternative 1: No Action

There would be no direct effects to water resources from the proposed action. Current conditions and trends as described in the Affected Environment (Section 3.3.5.1) would continue. High stream

velocities would continue to scour substrate and stream banks transporting substrate and organic material downstream. The current low levels of LWD in channels would slowly decrease further as more logs rot, break apart, and move downstream. Over time (40+ years), trees near streams would grow and drop into streams and begin to reverse these conditions. Gradually channels would become more stable and the channel morphology would become more complex and diverse. The quantity and quality of pools would increase.

Sediment would continue to be routed to streams from Federal, state, and private lands. The Roaring Creek Road segment and the “north” road would continue to transport elevated levels of sediment into Roaring Creek. In the long-term, some road segments are likely to fail, potentially sending large sediment loads into streams.

Because this no action alternative would not alter current condition or trends, when combined with other past, present, and reasonably foreseeable actions, there would be no incremental cumulative effect to essential fish habitat.

Cumulative Effects

Because this no action alternative would not alter current condition or trends, when combined with other past, present, and reasonably foreseeable actions, there would be no incremental cumulative effect to essential fish habitat. It is anticipated that current trends occurring on non-federal lands in the watershed would continue combined with the no action alternative would result in steady declines of LWD in the stream channel until federal forest trees mature and begin falling into the stream channel.

3.3.7.3 Environmental Effects Alternative 2: The Proposed Action

There are effects anticipated from planned LWD additions to stream channels where EFH occurs. These effects would range from an aversion response to the potential of mortality for a few individuals. When these trees are placed these species may move away either from a tree falling in the water or as a result of short pulses of generated sediments.

Effects of the Proposed Action to Essential Fish Habitat and MSA species

There are no specific criteria described in the regulations to assess for effects to EFH. The definitions for *EFH*, *Waters* and *Substrate*, suggest the following criteria be evaluated; water quality, water quantity, substrate characteristics, large woody debris (LWD) within the channel and LWD source areas, channel geometry, fish passage, and forage species (aquatic and terrestrial invertebrates). Effects to MSA species from the proposed action could include an aversion response and the chance of direct mortality on a few individual fish. While this action may elicit a behavioral response on a few individual fish it would have no effect on the long-term sustainability of the population as a whole. There are no anticipated long-term adverse impacts of the proposed action on EFH.

Machine placement and/or falling and/or topping of selected trees directly into the stream channel would result in localized turbidity. It is not anticipated that this would exceed 2 hours in any 24 hour period. The placement of trees in the stream channel and the road decommissioning actions would be implemented consistent with the Project Design Criteria (PDC) contained in NOAA fisheries Biological Opinion dated December 12, 2006 for ‘USDA Forest Service (Pacific Northwest Region), USDI Bureau of Land Management (Oregon State Office), and the Coquille Indian Tribe for Fish Habitat Restoration Activities Affecting ESA and MSA-listed Animal and Plant Species found in Oregon and Washington.’

For the instream placement of wood, PDCs are:

1. Place LW and boulders only in those areas where they would naturally occur and in patterns that closely mimic that which would naturally occur for that particular stream type.
2. LW includes whole conifer and hardwood trees, logs, and root wads. LW size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5 x bankfull channel width, while logs without rootwads should be a minimum of 2.0 x bankfull width. Place wood in a manner that most closely mimics natural accumulations of LW for that particular stream type. Structures may partially or completely span stream channels or be positioned along stream banks.
3. No conifers should be felled in the riparian area for in-channel large wood placement unless conifers are fully stocked and are consistent with project design criteria in vegetation treatment categories. Felled hazard trees can be used for in-channel wood placement.
4. Key boulders (footings) or LW may be buried into the stream bank or channel but shall not constitute the dominant placement method of boulders and LW.

For the road decommissioning, PDCs are:

1. For road removal projects within riparian areas, recontour the affected area to mimic natural floodplain contours and gradient to the greatest degree possible.
2. For those road segments immediately adjacent to the stream or where the road fill is near the wetted stream, consider using sediment control barriers between the project and the stream.
3. Drainage features should be spaced to hydrologically disconnect road surface runoff from stream channels.
4. Dispose of slide and waste material in stable sites out of the flood prone area. Waste material other than hardened surface material (asphalt, concrete, etc) may be used to restore natural or near-natural contours.
5. Minimize disturbance of existing vegetation in ditches and at stream crossings to the greatest extent possible.
6. Conduct activities during dry-field conditions – low to moderate soil moisture levels.
7. When removing a culvert from a first or second order, non-fishing bearing stream, project specialists shall determine if culvert removal should follow the isolation criteria as describe in Activity #5 above. Culvert removal on fish bearing streams shall adhere to the measures describe in #5 above.
8. For culvert removal projects, restore natural drainage patterns and when possible promote passage of all fish species and life stages present in the area. Evaluate channel incision risk and construct in-channel grade control structures when necessary.
9. If other aquatic restoration activities are used as complementary actions, follow the associated design criteria and conservation measures.

Effects to substrate as a result of this action are not anticipated to occur until streams in the area rise to or near to bankfull stage. These effects are anticipated to be both beneficial and adverse. As the streams in the area begin to rise during large winter storm events, sorting and routing processes of instream substrates would begin to occur, which would produce small pulses of sediment. However, with the addition of LWD the transport of gravels within this stream segment would change. The greatest change anticipated is the trapping and aggregation of the stream channel or the formation of pools adjacent to where LWD is added which would increase fisheries habitat.

With the implementation of this project adverse impacts are predicted to individual fish however these adverse affects are offset by beneficial effects to their habitat. The loss of a few individual fish would not elevate concern for these species, their status or contribute to the need to list under the Endangered Species Act. Coho salmon spawn and rear in Roaring Creek and the Upper Tualatin River. Adult coho salmon enter the streams in the fall-early winter to spawn with juvenile coho salmon present year-round.

Water Quality, Water Quantity, and Substrate Characteristics

As described in the hydrology analysis (section 3.3.5.3) the proposed action would directly alter the streamflow and channel morphology, increasing the structural complexity along approximately 1.1 miles of Roaring Creek. The addition of LWD would redirect flow, reducing stream gradient and flows. As a consequence it would diminished stream velocities, increase pools, trap more sediment and organic matter, and possibly reduce the width-to-depth ratio. The addition of wood would result in some minor channel adjustments, potentially temporarily increasing sediment and turbidity. These increases would be small and difficult to detect from background conditions.

Most of the effects would occur within the first year or two after project implementation. Over the long-term, placed logs would continue to trap more wood and sediment. Riparian trees would continue to grow in size and fall in the channel, adding more complexity and stability to the channel.

The proposed action is unlikely to affect water temperature. Placement of LWD is expected to remove no more than a few trees from the stream side buffers. Most of the increase in sedimentation would occur during the first year or two after disturbance. Most sediment would likely be stored in the upper reaches of streams where it would remain until a storm event occurs and transports it downstream, adding a negligible and indiscernible portion to the sediment load.

Large Woody Debris (LWD) in channel and source areas:

Most of the trees proposed for LWD would come from hillsides far away from any stream channels and are not expected to affect LWD recruitment to tributary or mainstem channels. The few trees that may be selected from the riparian stream buffer would only come from fully stocked tree stands and would only be used if, by selecting them, there is no decrease in the amount of overall shade along the stream.

Fish Passage:

The implementation of the fish habitat restoration project has no effect on fish passage in the watershed.

Forage Species: Juvenile coho forage primarily on insects that fall into streams from adjacent riparian vegetation and drifting aquatic insects in the water column. Most of the riparian areas within the project area have mixed stands of hardwoods and conifers with a dense shrub understory. Stream channels substrates have a mix of gravels, cobbles and boulders that provide good quality habitat for macro-invertebrates. The potential removal of a few trees from areas of fully stocked streamside buffers would have no measurable effect on forage species. The implementation of the fish restoration project should be beneficial to forage species by increasing the stream complexity and providing areas of increased macro-invertebrates productivity (log jams).

Channel Geometry

The project action of adding large wood to channels would directly alter the streamflow and channel morphology, increasing the structural complexity along approximately 1.1 miles of Roaring Creek. Addition LWD would redirect flow, reducing stream gradient and flows. As a consequence it would diminished stream velocities, increase pools, trap more sediment and organic matter, and possibly reduce the width: depth ratio. The addition of wood would result in some minor channel adjustments, potentially temporarily increasing sediment and turbidity. These increases would be small and difficult to detect from background conditions.

LWD

The majority of trees used for the fish habitat restoration project would come from stands far away from the streamside buffer zone. The few trees selected from the riparian buffer would be widely spaced and only removed from areas where the stands are fully stocked. The small reduction in LWD from the stream buffer would have a discountable and insignificant impact on future LWD recruitment to the stream channel. The removal of trees from riparian areas may reduce the amount of future LWD that could potentially be recruited into stream channels and shape stream morphology. This action, however, is expected to have little to no effect to future LWD. The number of trees removed would be small and in the long-term density management would accelerate the growth of larger diameter trees that would provide long-term sources of large wood for in-stream habitat.

Road Density

Roads proposed for decommissioning include approximately 1 mile Roaring Creek Road (2 acres) in Section 34 and 0.4 miles (0.8 acres) of an unnamed road (“North Road”) in the northern portion of Section 33. About 1/2 of the road segment is hydrologically connected to Roaring Creek. The road has 4 intermittent and 2 perennial stream-crossing culverts. Visible turbidity has been observed in the road ditch and stream crossing in the winter time. The road in Section 34 is located on a slowing moving earthflow. Parts of the “North Road” are badly slumping. The proposed project would result in a net decrease in road density of 1.4 miles.

Cumulative Effects

The proposed LWD stream restoration project would improve the current condition of the stream channel and maintain it until such time as natural LWD recruitment from federal forest lands occurs. The current trend on surrounding private forestlands is timber harvest according to the provisions contained in the Forest Practices Act. This may result in little or no conifer retention in the riparian zone on private timberlands that would contribute to future LWD inputs to the stream channels.

The cumulative effects of the proposed road decommissioning project would result in a net decrease in road density in the watershed of 1.4 miles. This is an improvement over the current condition and trends occurring on surrounding private timberlands.

3.3.8 Invasive, Nonnative Species (Executive Order 13112)

3.3.8.1 Affected Environment

Existing vegetation consists of a 50-70 year-old conifer over-story, scattered pockets of hardwoods, an under-story of common shrubs and scattered populations of grasses and forbs. A comprehensive plant list is located at the Tillamook Resource Area field office. A variety of habitats are represented throughout the project area (substrates, rock, features, elevations, slopes, aspects, water, and topography). Any ground-disturbing activity that occurs within these habitats offers opportunity for the introduction of noxious weeds and/or invasive non-native plant species based on the existence of a seed source. Botanical surveys for Invasive, non-native plant species within the Roaring Creek project were conducted in Spring of 2006. Additional surveys will be conducted in Spring of 2007 located in 1S-5W-sections 19,25 and 33. Where mature native plant communities are established, non-native species were non-existent. Non-native invasive species that were identified within the proposed project areas consisted of Bull thistle, (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), Scotch broom (*Cytisus scoparius*), Tansy ragwort (*Senecio jacobaea*), Himalayan blackberry (*Rubus discolor*), evergreen blackberry (*Rubus laciniatus*), St. Johns-wort (*Hypericum perforatum*), shining geranium (*Geranium lucidum*), oxeye daisy (*Leucanthemum vulgare*), and Reed canary grass (*Phalaris arundinacea*). These species were located along road edges, and exposed areas that tended

to have soil disturbance (i.e. open meadows, riparian areas and OHV trails). Most of these species are considered Priority III (established infestations) on the Oregon Department of Agriculture (ODA) Noxious weed list. These aggressive non-native plant species are prevalent throughout Western Oregon and proliferate easily through vectors such as motor or foot traffic, birds, wind, and water. Ground disturbing activities such as new road construction, reconstruction and decommissioning, bank stabilization, yarding corridors, tractor skid trail development, landing use, and haul road maintenance are the most likely activities that could produce conditions conducive to noxious weed establishment. Some degree of noxious/exotic weed introduction or spread is probable as management activities occur in the project areas.

3.3.8.2 Environmental Effects Alternative 1: No Action

Plant communities within the project area would continue to be dependant on ecological processes currently in place if no action is taken. No appreciable increase in the non-native or invasive plant species populations identified during the field surveys is expected to occur within the riparian area. However, as unpredictable, natural high water events occur creating sediment deposits and disturbance to existing native plant associations within the riparian area an increase of non-native invasive plant species will invade the areas where exposure to higher intensities of light have been introduced and seed sources become established.

Cumulative Effects

No cumulative affects would occur with a no action alternative.

3.3.8.3 Environmental Effects Alternative 2: The Proposed Action

Fish Habitat Restoration: Non-native invasive weed species within the project area were located along existing riparian areas. Initial increase in population size and new establishment due to Fish Habitat restoration activities should be confined to disturbance areas as described above in “affected environment” and would be expected to decrease over time as native species re-vegetate and the recovery of canopy closure occurs. The non-native invasive weed species identified do not tolerate overtopping and can be negatively affected by competition for light. Design features that are incorporated into this project such as: planting native plant species on disturbed sites and washing equipment prior to entering the project area, would mitigate increases in weed populations.

Cumulative Effects

The analysis area for cumulative effects to noxious/non-native invasive plant species is in the Northern Oregon Coast Range approximately 8 miles west of the town of Gaston, Oregon located in the upper reaches of the Roaring Creek watershed. Examples of forest management activities within the affected area that will create soil disturbance and influence the spread of noxious/non-native invasive plant species are: regeneration harvest, commercial and pre-commercial density management thinning, young stand maintenance, new road construction, road decommissioning, road maintenance, culvert replacements, helicopter landing zones, and off highway vehicle (OHV) trails. Activities that do not necessarily create disturbance but influence the spread of weed seeds are recreational hiking, biking, horseback riding, fishing, and hunting. Other sources of seed dispersal are from wildlife that are either passing through or frequent the area, water and soil movement, natural dehiscence and wind. Many past and present management activities tend to open dense forest settings and disturb soils therefore providing opportunities for widespread weed infestations to occur. Many, if not all of the weed species identified as Priority III (established infestations) on the Oregon Department of Agriculture's (ODA) noxious weed list are present

throughout the area. Because they are present in the project area, seed is readily available for dispersal. Most non-native weed species are not shade tolerant and will not persist in a forest setting as they compete for light when tree canopies close and light to the under-story is reduced.

4. PROJECT 3 - The Wildlife Habitat Enhancement Project

4.1 Purpose of and Need for Action

Objectives

By comparing the existing conditions of the landscape in the project area to the management direction contained in the Salem ROD/RMP, the IDT identified a number of specific resource conditions that do not meet the long-term management objectives. The proposed action is designed to modify these conditions, and move towards achieving the management direction described in the ROD/RMP.

The objective of this Project is to implement the following management direction from the ROD/RMP, pertaining to management of lands in the AMA and Riparian Reserve land use allocations.

- Enhance and maintain biological diversity and ecosystem health in order to contribute to healthy wildlife populations (pg. 24);
- Design projects to improve conditions for wildlife if they provide late-successional habitat benefits or if their effect on late-successional associated species is negligible (pg. 25);
- Provide for the maintenance of ecologically valuable structural components such as down logs, snags, large trees (pg. 20).

4.2 Alternatives

4.2.1 Alternative Development

Pursuant to Section 102(2) (E) of NEPA (National Environmental Policy Act of 1969, as amended), Federal agencies shall "...study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." No unresolved conflicts concerning alternative uses of available resources (section 102(2) (E) of NEPA were identified.

There are no action alternatives to the proposed action in Project 3

4.2.2 Alternative 1: No Action

The BLM would not implement the wildlife habitat enhancement project within the proposed project areas at this time. The plant and animal communities would continue to be dependant on ecological processes such as the natural CWD recruitment regime that is currently in place.

4.2.3 Alternative 2: The Proposed Action

In order to help meet the purpose and need as described above, the BLM proposes habitat enhancement that would benefit a variety of wildlife species in approximately 323 acres of upland or riparian forest (Figure 6). Although trees up to 36 inches DBH may be treated, it is expected that this project would primarily treat trees up to approximately 30 inches DBH.

In general, the proposal would treat an average of five trees per acre scattered throughout the units. The project may include felling of green trees, girdling green trees at the base as well as within the live crown, topping green trees and/or potentially inoculating trees with a heart rot fungus to enhance wildlife habitat.

Other potential design features include using CWD creation in such a way as to mimic bark beetle pockets and maximize the potential benefits through also releasing individual understory and/or overstory trees; some of these treated trees would be located in small clumps of up to about five trees or be used to surround individual selected overstory trees with a ring of created snags.

In a few situations, a more concentrated, individual tree release treatment may be applied thereby promoting the growth of individual large trees while augmenting CWD levels. Through a combination of snag creation and felling of up to 30 trees in a clump, a selected overstory tree would be released from competition. Trees selected for release would generally be the dominant trees within the area. Some clumps of treated trees could be positioned in association with existing hemlock or redcedar understory so as to potentially promote understory development.

Activities such as snag creation may occur during any time of the year. However as workloads allow, implementation would be scheduled to occur from July – September especially near those areas with high levels of *P. weiri* root rot to minimize the potential for excessive Douglas-fir bark beetle damage.

Riparian Reserves

Approximately 48% of the habitat enhancement project areas are located within Riparian Reserves. Treatments applied in the Riparian Reserves would extend down to the stream channel; trees in this area would be selected so that stream shading would not be appreciably affected.

4.2.3.1 Connected Actions

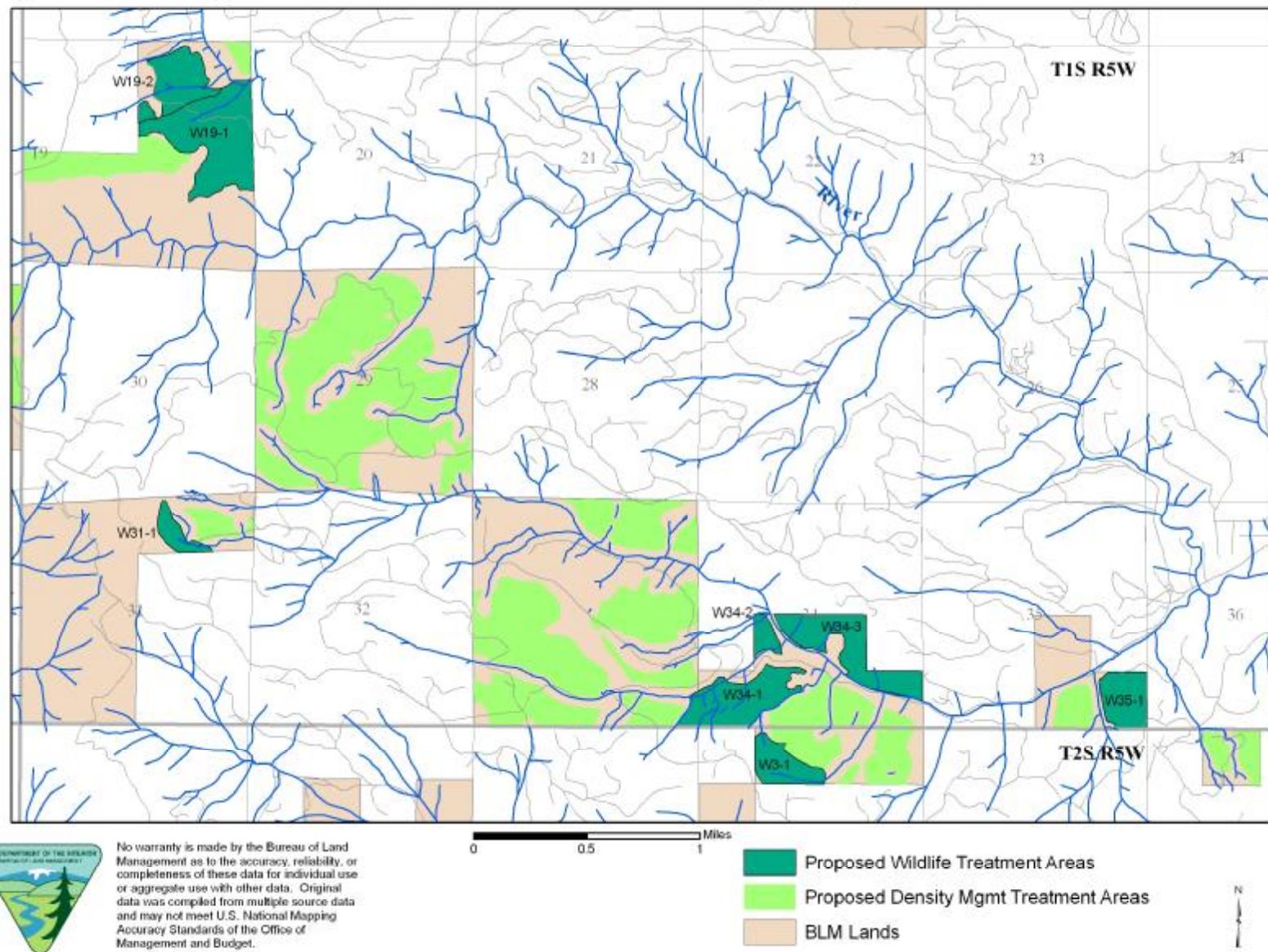
There are no connected actions for this project.

4.2.3.2 Project Design Features

Snag and Down Wood Creation

- § In general, only healthy appearing Douglas-fir would be treated. An exception is within unit W3-1, where western redcedar may be treated.
- § *Wildlife Special Status Species:* No tree which is potentially suitable as a nest tree for the bald eagle, spotted owl or marbled murrelet, or contains a suspected nest of any other bird or mammal would be treated. In addition, no tree adjacent to a potentially suitable bald eagle, spotted owl or marbled murrelet nest tree or any tree containing a suspected nest of a bird or mammal would be treated.
- § Trees selected for treatment would generally not include the largest, dominant trees within a given area, or trees with the fullest crowns and/or largest branches.
- § Felling of trees would be conducted in such a way as to assure no damage to potentially suitable spotted owl or marbled murrelet nest trees, or any tree containing a suspected nest of a bird or mammal.
- § Created snags or felled trees would generally not be located within approximately 150 feet of a drivable road or a property line boundary where BLM land abuts non-federal ownership. This would reduce the potential for the creation of a safety hazard and/or the likelihood that the material would be stolen or sold as firewood.

Figure 7 - Roaring Creek Wildlife Habitat Enhancement Project Map



- § All felled trees would be selected and felled in such a way as to minimize impacts to existing decay class 3, 4, and 5 down woody debris which is greater than 15 inches in diameter.
- § Treatments applied in the Riparian Reserves would extend down to the stream channel however trees in this area would be selected so that stream shading would not be appreciably affected.
- § Trees would only be felled into active stream channels during the in-stream work window (July 1 - September 30) unless an in-stream work window waiver is obtained from ODFW.
- § All felled trees would be selected and felled in such a way as to minimize impacts to existing decay class 3, 4, and 5 down woody debris which is greater than 15 inches in diameter.

4.3 Affected Environment and Environmental Effects

4.3.1 Forest Vegetation

4.3.1.1 Affected Environment

See description of the affected environment under section 2.3.1 for an overall description of the stands in the project area. The stands proposed for wildlife enhancement project are outside of the areas planned for variable-density thinning and range widely in age, species composition, and structural complexity. They are generally dominated by Douglas-fir, but some contain various amounts of other conifers (primarily western redcedar, grand fir, and western hemlock) as well as hardwoods (primarily bigleaf maple and red alder). Stands range in age from about 50 to over 200 years old. Some stands have a rather uniform tree distribution and in others, the tree distribution pattern tends to be more random. In wildlife treatment unit W19-1, located in section 19, the trees are somewhat aggregated in small clumps over a large proportion of the stand. Most areas have a single canopy layer, but wildlife treatment unit W31-1, located in section 31, is a two-storied stand. *P. weiri* root disease is common throughout most of the project area, with estimated levels of infection reaching 24% in some stands.

In the general area, the bulk of the existing coarse wood is relatively high, averaging 1,880 cubic feet per acre. Approximately 88% of the total coarse wood volume, however, is from down wood, and only 12% is from snags. In addition, the majority (60% on the average) of the total coarse wood volume occurs in the more advanced decay classes. The source of the more recent decay class down wood seems to be smaller trees that have died as a result of suppression or have been windthrown as a result of *P. weiri* root rot infection.

4.3.1.2 Environmental Effects Alternative 1: No Action

Left untreated, most of the stands would continue on their current developmental trajectories and rate of attainment of some key features (larger-sized snags and down logs, and larger-sized trees with large crowns) characteristic of older forests with complex structures would be delayed. The balance in the total coarse wood volume between snags and down wood would remain heavily in favor of down wood, and the total coarse wood volume would continue to be skewed towards the more advanced stages of decay. In addition, the crown development of some larger-sized trees would be restricted by encroachment from adjacent trees.

4.3.1.3 Environmental Effects Alternative 2: The Proposed Action

Implementation of the proposed 323-acre wildlife enhancement project should increase the structural complexity of the treated stands by adding larger-sized conifer snags and some recent-decay-class down wood both in a dispersed as well as in an aggregated pattern, creating small canopy gaps containing concentrations of snags and down wood around strategically located large individual conifer trees, and increase crown development of the large individual conifer trees that are released. In addition, project implementation should help improve the balance in the total coarse wood volume between snags and down wood as well as the balance in the total coarse wood volume among decay classes.

There is, however, some risk from Douglas-fir beetle attack and mortality associated with the “individual tree release” treatments when the trees to be released are Douglas-fir and the trees used to create snags or are felled are also Douglas-fir. This treatment would concentrate down logs and trees purposely injured to create snags around trees that are planned for release. Therefore, some Douglas-fir trees intended for release may be attacked and killed by Douglas-fir beetles which are attracted to and breed in fresh down Douglas-fir logs and trees that become stressed as a result of the snag creation treatments. Down logs are preferred for beetle breeding sites over standing trees. West of the Cascade Range summit, Douglas-fir beetles tend to infest trees greater than 12 inches dbh (Hostetler and Ross 1996). The design features of this individual-tree release project require that up to 20 trees less than 12 inches dbh are to be felled and up to 10 trees between 12 and 24 inches are to be girdled to create snags. Restricting felling to trees less than 12 inches should lessen the potential for unintended adverse consequences from Douglas-fir beetle mortality of the Douglas-fir trees being released. The risk could be further reduced by requiring that this treatment be accomplished during July through September because this is after the major beetle flight period and would allow the cambium of the felled trees to dry out and be less suitable for breeding material the following spring flight period (Hostetler and Ross 1996). Additionally, focusing these treatments a mile or so away from areas heavily infested with *P. weiri* root disease should lessen the potential for mortality of the released Douglas-fir trees because root disease centers tend to have higher local populations of beetles as a result of the continued supply of windthrown and stressed Douglas-fir trees for beetle breeding sites (Thies and Sturrock 1995). The Douglas-fir trees in the immediate vicinity of the release patches are also at an elevated risk from Douglas-fir beetle attack.

4.3.2 Threatened or Endangered Wildlife Species, Habitat and/or Critical Habitat

4.3.2.1 Affected Environment

The Wildlife Habitat Enhancement treatments range in age from approximately 57 years old to one 91.6 acre stand containing trees of several age-classes up to over 200-years-old. Douglas-fir dominates the majority of the stands proposed for treatment however western hemlock, western redcedar, grand fir as well as bigleaf maple, madrone and red alder can also be found in some of these conifer dominated stands. The majority of one of the proposed treatment units is dominated by western redcedar rather than Douglas-fir. Many of the riparian areas are dominated by hardwoods along the creeks and for various distances up the hillsides. Although there is some variability, portions of several of the stands proposed for treatment are relatively diverse in terms of vertical and/or horizontal stand structure while other areas are more homogeneous. This is largely a function of past management, stand age, relatively low stocking level of overstory trees and/or the presence of small pockets of laminated root rot disease within some areas proposed for treatment.

Current CWD levels within the proposed treatment areas vary but in general they are all deficient, especially in hard snags and logs. These stands are also deficient or lacking in some late-seral habitat features such as green trees with characteristics desirable for wildlife such as broken or dead

tops. The overall current condition, low occurrence, and limited distribution of these habitat features are likely limiting general biodiversity and/or populations of wildlife species within the area that benefit directly or indirectly from these types of habitats (e.g. snags, logs and green trees with defect).

Some of the stands proposed to be treated with the Wildlife Habitat Enhancement Project are adjacent to or intermingled with those stands proposed for treatment by the Roaring Creek Density Management Project.

There are no known special habitats (e.g., talus slopes, cliffs, caves, mines or abandoned wooden bridges) within the vicinity of the proposed project areas.

Northern Spotted Owl - (FT)

Designated Critical Habitat

Critical Habitat is designated by USFWS to provide for the conservation and eventual recovery of the species. None of the Wildlife Habitat Enhancement project areas are within Designated Critical Habitat for the spotted owl (USDI 1992).

Proximity to Known Spotted Owl Sites

There are no historic or known occupied spotted owl sites, 100-acre core areas as identified in the NWFP and Salem RMP or spotted owl RPAs (Reserve Pair Areas) within the Roaring Creek Wildlife Analysis Area, including within or near any of the proposed Wildlife Habitat Enhancement project areas. The nearest known spotted owl sites considered to be currently occupied are located approximately 6 miles south-west of the project areas, with another located approximately 7 miles to the north. The most recent available occupancy data at both of these sites suggests they were each occupied by a single spotted owl.

Spotted Owl Surveys

In cooperation with the Oregon Department of Forestry, spotted owl protocol surveys are scheduled to be conducted during the 2007 and 2008 survey seasons within the westernmost portion of the BLM parcels included with the Roaring Creek EA. Sections to survey will likely include sections 19, 29, 31 and 25; these sections include Wildlife Habitat Enhancement treatment units W19-1, W19-2 and W31-1. BLM parcels included with the Roaring Creek EA which will not be surveyed include sections 33, 34, 35, 1 and 3; these sections include Wildlife Habitat Enhancement treatment units W34-1, W34-2, W34-3 and W35-1. There are approximately 195 acres of suitable spotted owl habitat which are not scheduled to be surveyed within 0.25 miles of a proposed Wildlife Habitat Enhancement treatment unit.

Spotted Owl Habitat within the Treatment Units

The Wildlife Habitat Enhancement Project proposes to treat a total of approximately 323 acres of conifer-dominated forest. A total of approximately 202 acres are considered to be suitable habitat for the spotted owl and approximately 121 acres of the proposed treatment areas are considered to be dispersal habitat for the spotted owl.

Portions of the stands proposed for treatment are considered to be of a marginal quality, suitable or dispersal habitat based upon stand age, lack of CWD (especially hard snags) and/or simple stand structure. Conditions that keep these stands from being considered higher quality habitat for owls primarily include the lack of nesting substrates (such as large sheltered platforms or large cavities in snags) and the lack of habitat for a suitable prey base, which is primarily the northern flying squirrel in this area. Flying squirrels have been found to be about twice as abundant in late-seral and old-growth stands as in younger seral stands and their presence is positively correlated to the abundance of large snags (Carey 1991).

However, other portions of the stands proposed for treatment exhibit features and contain some habitat elements of higher quality habitat (most notably unit W19-1). This stand has more complex horizontal and vertical stand structures, greater species diversity including scattered hardwoods, relatively abundant large old-growth trees and all set in the context of a relatively large block of unfragmented mid-seral to mature conifer habitat. However, existing CWD within this stand appears to be heavily skewed toward later-decay class down logs. While scattered snags are present, it was determined that the habitat quality could benefit from additional CWD including higher quality snags.

Marbled Murrelet – (FT)

Designated Critical Habitat

Critical Habitat is designated by USFWS to provide for the conservation and eventual recovery of the species. A total of 158 acres of the Wildlife Habitat Enhancement Project areas within sections 3 and 19 are located within a Marbled Murrelet Designated Critical Habitat Unit (CHU # OR-02-e) (USDI 1996).

Proximity to Known Murrelet Sites

With the nearest known occupied marbled murrelet site being approximately 15 miles from a proposed treatment unit, there are no known occupied murrelet sites within the vicinity of any of the proposed Wildlife Habitat Enhancement Project areas.

Suitable Habitat and Murrelet Surveys

One treatment unit, approximately 91.6 acres in size (unit W19-1) contains marbled murrelet suitable habitat. Unit W19-2 is directly adjacent to this habitat. Protocol surveys are scheduled to be conducted within and near this stand of suitable habitat for murrelets during the 2007 and 2008 survey seasons. A portion of one additional unit (W34-3) is within 0.25 miles of a small patch of marbled murrelet suitable habitat contained within section 3; protocol surveys are also scheduled to be conducted within this stand of suitable habitat.

Bald Eagle – (FT)

Proximity to Known Eagle Sites

There are no known bald eagle communal winter roosts within the Analysis Area. The nearest known bald eagle nest is near Henry Hagg Lake, approximately 3.5 miles northeast of the nearest unit proposed for treatment with the Wildlife Habitat Enhancement project.

No known eagle sightings have been recorded within or near the proposed treatment areas, however dispersed eagle usage, primarily roosting or resting, may occur throughout the Analysis Area including near the project areas wherever suitable habitat is present. This occasional, dispersed eagle usage would most probably occur during the late fall or winter months.

Eagle Habitat

There is a total of 57 acres of suitable bald eagle habitat within one of the proposed Roaring Creek Wildlife Habitat Enhancement units (W19-1); this represents 24% of the 239 acres of identified eagle habitat within the Analysis Area. Approximately half of the remaining identified eagle habitat within the Analysis Area is within a 0.25 miles or 0.5 mile line-of-sight of a proposed Wildlife Habitat Enhancement treatment unit.

Although there is no additional suitable eagle habitat (as defined on Figure 3) identified within the Analysis Area beyond the 239 acres discussed above, it is possible that a limited number of unidentified scattered individual trees or small groups of trees which are suitable to eagles for

roosting or resting may be located within or near some of the treatment units or along portions of the various haul routes.

4.3.2.2 Environmental Effects Alternative 1: No Action

Under this alternative the BLM would not implement the Wildlife Habitat Enhancement Project. The plant and animal communities would continue to be dependant on ecological processes such as the natural CWD recruitment regime that is currently in place. Under the “No Action” Alternative, the identified impacts of the action alternative upon wildlife and/or wildlife habitat would not occur within the identified treatment units at this time.

A total of 323 acres of mature forest would not receive treatment to augment current CWD levels in the form green trees converted into snags or snag topped green trees. The CWD habitat components within the treatment units would continue to be heavily weighed toward down logs of the later decay classes rather than having a wider range of decay classes present within the stands and a larger percentage of the total CWD volume present in the form of snags. The forest stands would continue to grow and develop without management intervention. The development of those features of late-seral stage habitat promoted by implementation of the Wildlife Habitat Enhancement Projects (e.g. green trees with defect and snags) would be expected to occur in a slower time frame than under Alternative 2. The Desired Future Condition, late-seral stage habitat with a CWD level equal at least to 3200 to 5940 cubic feet of CWD per acre, spread across all decay classes with approximately half of the volume being in snags and half in down logs would be expected to be eventually reached, but over a longer period of time.

There are no identified cumulative impacts to wildlife or wildlife habitat associated with the No Action Alternative.

Selection of the “No Action” Alternative would be of *NO EFFECT* upon the marbled murrelet, spotted owl, bald eagle and all other species listed under the ESA

4.3.2.3 Environmental Effects Alternative 2: The Proposed Action

Snag creation by tree topping, or girdling at the base or within the crown, would help promote the development of various habitat features such as dead snags or live trees with broken and/or dead tops or other defect; decay, hollow cavities and/or loosened bark; large, thick or clustered branches; and eventually down logs. Creating conifer snags may retain or increase populations of cavity nesters in areas with low natural snag densities. The topping of trees, would add complexity to the forest floor in the form of fresh logs in areas which are currently lacking downed wood or heavily dominated by softer logs of the later decay classes. All of these features serve as vital denning, hiding, roosting, nesting, drumming, and/or foraging sites for a large range of species and are important components in late-successional forest communities.

Treated trees which are located in clumps with the consideration of providing additional light or growing space to individual and small groups of overstory or understory trees would, on a very localized scale, help promote the development of larger conifers, small gaps in the canopy and/or a multi-storied structure. This would help accelerate crown expansion, stand differentiation, understory development and result in an increased level of diversity, both within the immediate area of the treated tree(s) and across the stand as a whole.

From cumulative impacts perspective the Wildlife Habitat Enhancement Project would help offset some of the identified short- and/or long-term adverse impacts to existing habitat resulting from the various identified BLM, State and private timber management projects through the enhancement of current and future late-seral habitat within the Analysis Area. These impacts include impacts to existing snags and future, natural snag recruitment processes.

Northern Spotted Owl - (FT)

Designated Critical Habitat

The proposed Roaring Creek Wildlife Habitat Enhancement Project would not occur within or near spotted owl Designated Critical Habitat therefore, the proposed project would be of *NO EFFECT* upon spotted owl Designated Critical Habitat.

Impacts to Known Spotted Owl Sites

There are no historic or known occupied spotted owl sites therefore no impacts to any currently known spotted owl sites would be expected to result from implementation of the Roaring Creek Wildlife Habitat Enhancement Project.

Potential for Disturbance

There are approximately 195 acres of suitable spotted owl habitat which is not scheduled to be surveyed within 0.25 miles of a proposed Wildlife Habitat Enhancement treatment unit.

Note: Should these owl surveys result in the identification of an occupied spotted owl site within the vicinity of the proposed treatments, the project would either be modified to meet the standards of the appropriate programmatic consultation; a project-specific ESA consultation would be initiated with USFWS to address the impacts resulting from the project as planned; and/or based upon the site-specific situation, discussions would be initiated with the North Coast Planning Province Interagency Level 1 Team (including USFWS) to address the discrepancy.

Activities that generate noise above the ambient level or involve climbing into the canopy more than 25 feet have the potential to disturb spotted owls. Activities such as snag creation may occur during any time of the year including within the spotted owl critical breeding season or non-critical breeding season. However as workloads allow, implementation would be scheduled to occur from July – September especially near those areas with extensive *P. weiri* infestations to help minimize the potential for excessive Douglas-fir bark beetle damage.

Proposed disruptions within or near unsurveyed suitable habitat with no history of an owl nest site or activity center have the potential to occur within the disruption distance of an active nest site during the breeding season, however the potential likelihood of impacts is considerably less than operations occurring within the vicinity of a known nesting pair of spotted owls. Therefore, potential disturbance resulting from implementation of the Roaring Creek Wildlife Habitat Enhancement Project *MAY AFFECT but is NOT LIKELY TO ADVERSELY AFFECT* spotted owls.

Impacts to Spotted Owl Habitat

Based upon the nature of the proposed treatments, no adverse impacts to spotted owl suitable habitat are expected; no suitable habitat would be degraded or removed from its current condition to function as suitable habitat. No tree which is currently suitable as a spotted owl nest tree or any tree adjacent to a potentially suitable nest tree would be impacted.

Beneficial impacts resulting from the Wildlife Habitat Enhancement Projects include increasing the abundance of major constituent elements of spotted owl habitat in areas identified as deficient in those elements - Coarse Woody Debris in the form of both snags and down logs, as well as green trees with defect such as broken or dead tops. Created snags or snag-topped green trees would generally enhance the quality of owl habitat through providing potential denning and foraging sites for various prey species or possibly by over time, developing into suitable spotted owl nest trees. Several studies have found a strong positive correlation between the amounts of CWD within a stand and the abundance of numerous small-mammal species including the northern flying squirrel,

the spotted owl's primary prey species in much of the Pacific Northwest (Carey and Johnson 1995, Carey et al 1997).

Implementation of the Roaring Creek Wildlife Habitat Enhancement Project *MAY AFFECT but is NOT LIKELY TO ADVERSELY EFFECT* the spotted owl based upon the beneficial impacts to spotted owl habitat discussed above. No adverse affects to owl habitat were identified as a result of implementing the proposed project.

There are no identified adverse cumulative impacts to spotted owl suitable habitat as a result of the Roaring Creek Wildlife Habitat Enhancement. From a cumulative impacts perspective, the Wildlife Habitat Enhancement Project would help offset some of the identified short- and/or long-term adverse impacts to existing and future habitat resulting from the various past, present and foreseeable timber harvest operations within the Analysis Area including the identified BLM commercial density management projects. These impacts include impacts to existing snags and future, natural snag and log recruitment processes. The Wildlife Habitat Enhancement Project would enhance the current and future late-seral habitat features within the Analysis Area.

Marbled Murrelet - (FT)

Designated Critical Habitat

Critical Habitat is designated by USFWS to provide for the conservation and eventual recovery of the species. A total of approximately 158 acres of the Wildlife Habitat Enhancement Project areas within sections 3 and 19 are located within a Marbled Murrelet Designated Critical Habitat Unit (CHU # OR-02-e) (USDI 1996).

Some of the treatment units within murrelet Critical Habitat contain trees with potential nesting platforms. No trees with potential murrelet nesting platforms would be impacted as a result of the Roaring Creek project and no openings would be created within one tree length surrounding a potential murrelet nest tree. The majority of the trees selected for treatment would include those trees with relatively little crown development and the average canopy closure of the treated stands would be negligibly reduced. Although protection measures have included in the design of the project, Alternative 2 *MAY AFFECT but is NOT LIKELY TO ADVERSELY AFFECT* Designated Critical Habitat for the marbled murrelet based upon the potential for minor beneficial and/or adverse impacts to primary constituent elements of Critical Habitat.

Impacts to Known Murrelet Sites

With the nearest known occupied marbled murrelet site being approximately 15 miles from the proposed project areas, there are no known murrelet sites within the vicinity of any of the proposed Wildlife Habitat Enhancement Project. No known murrelet sites would be impacted by the proposed action.

Potential for Disturbance

Based upon the fact that all the known suitable murrelet habitat within or within a minimum of approximately 0.25 miles of the proposed habitat enhancement treatment units will be surveyed to protocol and found to be unoccupied prior to project implementation the project would be of *NO EFFECT* upon the marbled murrelet as a result of disturbance.

Note: Should the scheduled murrelet surveys result in the identification of an occupied murrelet site within the vicinity of the proposed treatments, the project would be modified to meet the standards and guides of the NWFP and Salem District RMP. This would include protecting all contiguous existing and recruitment habitat for marbled murrelets (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years) within a one-half

mile radius of any site where the birds' behavior indicates occupation; this could including a change in the Land Use Allocation to (unmapped) LSR as appropriate. This "new information" would be documented and addressed in the Final Decision documentation for the Roaring Creek Projects. If necessary, interagency Level 1 Team (terrestrial sub-group) for the North Coast Province - including USFWS, would be informed to assure compliance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended.

Impacts to Murrelet Habitat

Based upon the scale and nature of the proposed treatments, minimal adverse or beneficial impact to the suitability of the treatment areas for murrelet use is anticipated. All known potentially suitable habitat within the area of the proposed action has been or will be surveyed to protocol. No tree which is currently, potentially suitable as a murrelet nest tree nor any tree adjacent to a potential murrelet nest tree would be impacted. The majority of the trees selected for treatment would include those trees with relatively little crown development and the average canopy closure of the treated stands would be negligibly reduced.

The Wildlife Habitat Enhancement project *MAY AFFECT but is NOT LIKELY TO ADVERSELY AFFECT* the murrelet as a result of habitat modification.

There are no identified cumulative impacts to marbled murrelet habitat as a result of the Roaring Creek Wildlife Habitat Enhancement Project.

Bald Eagle - (FT)

Impacts to Known Eagle Sites

There are no known bald eagle communal winter roosts within the Analysis Area. The nearest known bald eagle nest is near Henry Hagg Lake, approximately 3.5 miles northeast of the nearest unit proposed for treatment with the Wildlife Habitat Enhancement project. If a new bald eagle nest or roost is discovered, any project activity within 0.25 mile or 0.5-mile sight distance would immediately be evaluated by the unit wildlife biologist for potential effects on bald eagles and mitigated to prevent disturbances. No impacts to any known eagle sites would be expected to result from implementation of the Roaring Creek Wildlife Habitat Enhancement Project.

Potential for Disturbance

The potential dates of operation for the proposed project are such that activities may occur which would generate noise above the ambient level during the eagle breeding season however there are no known eagle nests or communal roost sites within the vicinity of the project. Dispersed eagle usage may occur throughout the Analysis Area including the project areas wherever suitable eagle habitat is present; this eagle usage of the area would most probably occur during the late fall or winter months.

As a result of project implementation, the project may generate noise above the ambient level and other disturbing activities which could displace dispersed foraging, perching or resting eagles; it would be expected that these displaced birds would simply, temporarily relocate to other areas containing suitable habitat and lower levels of activity.

It has been determined that implementation of the proposed Wildlife Habitat Enhancement Project *MAY AFFECT but is NOT LIKELY TO ADVERSELY AFFECT* the bald eagle as a result of an increased potential for disturbance.

Habitat Modification

Post-treatment, the acres of suitable eagle habitat treated by the Wildlife Habitat Enhancement would be expected to continue to function as suitable eagle habitat.

Based upon the scale and nature of the proposed treatments, no short or long-term adverse impacts to eagle habitat are expected. The creation of additional snags within these areas has the potential for some minor longer-term beneficial impacts to the quality of eagle habitat within the area through providing an increased opportunity for roosting sites and given enough time, potential nest sites. These beneficial impacts to eagles are however considered to be relatively minor based upon the quantities of potentially suitable nest trees currently existing within the general area.

Because nesting, roosting and foraging bald eagles are sufficiently visible, it is unlikely that habitat enhancement activities would occur in areas currently used by bald eagles and therefore the potential for adverse impacts to eagles is considered negligible. Due to the nature of the project and the expected impacts, the Roaring Creek Wildlife Habitat Enhancement project would have *NO EFFECT* on bald eagles based on habitat modification.

4.3.3 Special Status and SEIS Special Attention Wildlife Species and Habitat

4.3.3.1 Affected Environment

Mollusks – (BS) and/or Survey and Manage

The proposed habitat enhancement project areas contain suitable habitat for mollusks including species on the Bureau's Manual 6840 Special Status Species List and/or identified as Survey and Manage Species. However, based upon the various project design features, as well as the nature of the habitat features to be impacted, the habitat enhancement projects have been determined not to be "habitat altering" to the point of triggering the need for pre-project S&M mollusk surveys.

In some situations, where a habitat enhancement treatment unit is adjacent to a proposed density management treatment unit, mollusk surveys may have been conducted within portions of the habitat enhancement unit even though the expected impacts of the wildlife habitat enhancement treatment are not believed to be of the nature to trigger the need to conduct pre-project surveys. These surveys resulted in no mollusk species currently on the Bureau's Manual 6840 Special Status Species List and/or identified as Survey and Manage Species being located.

Columbia Torrent Salamander - (BS) Bureau Sensitive

The Columbia torrent salamander is strongly associated with the splash zone directly adjacent to permanently flowing streams and seeps. Pre-project surveys conducted for the Roaring Creek projects resulted in six Columbia torrent salamanders being located, they are assumed to be present where suitable habit is present. Portions of the habitat enhancement project areas may be located in direct proximity to suitable torrent salamander habitat. While only a relatively small portion of the treatment areas would be expected occur within areas of suitable habitat for this species, approximately 50% of the habitat enhancement project areas are located within Riparian Reserves. Treatments applied in the Riparian Reserves would extend down to the stream channel however trees in this area would be selected so that stream shading would not be appreciably affected.

NWFP Bats

The NWFP and Salem District RMP identify five species of bats that would benefit from additional habitat protection. Four of these five species have potential of being located within or near the proposed action areas. These species include the fringed myotis, long-eared myotis, long-legged myotis, and the silver-haired bat. All of these bat species are known to inhabit mature and immature coniferous forest and may forage near riparian areas, open areas, and along forest edges while utilizing large hollow trees for roosting, hibernating, and maternity colonies.

There are no known bat roosting or hibernaculum sites within the project area. Surveys for these species are required under the NWFP and RMP if caves, mines, or abandoned wooded bridges and buildings are within or near the project area. There are none of these habitat types or structures within or near the project area therefore no bat surveys are required. No bat surveys are scheduled to be conducted within or near the Roaring Creek project areas.

Townsend's Big-Eared Bat - (BS)

In addition to the bat species identified within the NWFP, one species of bat, Townsend's big-eared bat, is covered by the Bureau's Special Status Species Policy. Townsend's big-eared bats are seldom abundant but are known to occupy a variety of habitats. In western Oregon, these bats are associated with coniferous forests, but they are also considered characteristic dwellers of caves, abandoned mines, and buildings. No caves, abandoned mines or buildings are known to be located within the vicinity of the proposed action. Some of the more open forested and riparian habitats within and near the proposed treatment units could function as foraging habitat and it is possible although rather unlikely that this species of bat could be encountered within or near the proposed project area.

Red Tree Vole – (dusky sub-species) - (BS) and Survey and Manage

The red tree vole is generally associated with mature or old-growth conifer or mixed hardwood-conifer forests. The tall, multi-layered canopies of mature or old-growth forests retain humidity and intercept fog, which functions as a climatic buffer and a source of free water. Large branches of mature and old-growth trees provide stable support for nests, protection from storms and travel routes. Although red tree voles have been located within younger stands, especially if they are contain a component of larger remnant trees, mature and old-growth stands are thought to be their optimal habitat.

The majority of the proposed Wildlife Habitat Enhancement treatment units contain suitable habitat for the red tree vole and it is possible that portions of these areas are currently occupied by red tree voles.

While the nature of the proposed treatments would not trigger the need for pre-project protocol surveys, the proposed Wildlife Habitat Enhancement treatment unit containing the highest quality late-seral habitat within the Analysis Area (Unit W19-1) was recently incorporated into a Tillamook and Mary's Peak Resource Areas (Salem District BLM) effort unrelated to pre-project surveys, to locate red tree voles and/or their nests. In conjunction with this effort, trees within the stand, including numerous residual old-growth, were sampled by climbing 70 trees and looking for red tree voles and/or tree vole nests; none were located within this area.

4.3.3.2 Environmental Effects Alternative 1: No Action

Under this alternative the BLM would not implement the Wildlife Habitat Enhancement Project. The plant and animal communities would continue to be dependant on ecological processes such as the natural CWD recruitment regime that is currently in place. Under the "No Action" Alternative, the identified impacts of the action alternative upon wildlife and/or wildlife habitat would not occur within the identified treatment units at this time.

A total of 323 acres of mature forest would not receive treatment to augment current CWD levels in the form green trees converted into snags or snag topped green trees. The CWD habitat components within the treatment units would continue to be heavily weighed toward down logs of the later decay classes rather than having a wider range of decay classes present within the stands and a larger percentage of the total CWD volume present in the form of snags. The forest stands would

continue to grow and develop without management intervention. The development of those features of late-seral stage habitat promoted by implementation of the Wildlife Habitat Enhancement Projects (e.g. green trees with defect and snags) would be expected to occur in a slower time frame than under Alternative 2. The Desired Future Condition, late-seral stage habitat with a CWD level equal at least to 3,200 to 5,940 cubic feet of CWD per acre, spread across all decay classes with approximately half of the volume being in snags and half in down logs would be expected to be eventually reached, but over a longer period of time.

There are no identified cumulative impacts to wildlife or wildlife habitat associated with the No Action Alternative.

Selection of the “No Action” Alternative would not be expected to adversely impact (result in a loss in population viability or elevate their status to any higher level of concern) any of the wildlife Special Status, or other Species of Concern discussed above.

4.3.3.3 Environmental Effects Alternative 2: The Proposed Action

Primarily as a result of the nature and scope of the proposed project (including incorporated design features to minimize the potential for adverse impacts) as well as the nature of the habitats impacted, implementation of the Wildlife Habitat Enhancement Project would not be expected to result in the loss of population viability for any Special Status Species that may occur in the project area, or result in the need to elevate their status to any higher level of concern including the need to list under the ESA.

Overall, a wide range of species including Special Status Species which utilize or depend upon snags, green trees with defect and/or downed logs would be expected to benefit from the proposal. In addition to those species discussed below, other species such as the clouded salamander and pileated woodpecker (both Bureau Tracking species) would be expected to benefit from implementation of the Wildlife Habitat Enhancement Project.

From cumulative impacts perspective the Wildlife Habitat Enhancement Project would help offset some of the identified short- and/or long-term adverse impacts to existing habitat resulting from the various identified BLM, State and private timber management projects through the enhancement of current and future late-seral habitat within the Analysis Area. These impacts include impacts to existing snags and future, natural snag recruitment processes.

Mollusks- (BS) and/or Survey and Manage

Due to the nature of the project, negligible adverse impacts to Special Status mollusk species or their habitats are expected to result from the proposed wildlife habitat enhancement projects. Should any populations of mollusk species of concern be present within or near a treatment unit, the project would not be expected to adversely impact the maintenance of the population at the site, or contribute to the need to elevate their status to any higher level of concern including the need to list under the ESA.

Some mollusk species are known to make use of large and small woody debris especially that of the later decay classes. The project proposes to augment existing CWD levels; although relatively minor in scale, this is viewed as beneficial to the maintenance and/or promotion of higher quality mollusk habitat.

Columbia Torrent Salamander - (BS) Bureau Sensitive

The Columbia torrent salamander is strongly associated with the splash zone directly adjacent to permanently flowing streams and seeps. In pre-project surveys primarily conducted for the Roaring Creek Density Management Project, no individuals were located within the proposed Roaring Creek

Wildlife Habitat Enhancement units; however they are assumed to be present wherever suitable habit is present. Small portions of the habitat enhancement project areas may be located in direct proximity to suitable torrent salamander habitat. Treatments applied in the Riparian Reserves would extend down to the stream channel, however trees in this area would be selected so that stream shading would not be appreciably affected. Trees would only be felled into active stream channels during the ODFW in-stream work window (July 1 - September 30) unless an in-stream work window waiver is obtained from ODFW.

While only a relatively small portion of the treatment areas would be expected to occur within areas of suitable habitat for this species, there is potential for the project to minimally impact suitable torrent salamander habitat. These adverse impacts are considered to be short-term and negligible based upon the nature of the project, minor scope of the expected impacts to habitat quality and extremely small portion of the available habitat to be impacted. In the long-term, any CWD additions to riparian areas containing suitable salamander habitat would be viewed as beneficial in that it would serve to add structural diversity and increase the micro-habitats available for this species.

Bats (including NWFP bats and the Townsend's Big-Eared Bat)

There are no known bat roosting or hibernaculum sites within the project area.

Bats are known to forage near riparian areas, within open areas, and along forest edges. The Wildlife Habitat Enhancement project would be expected to a somewhat minor degree, improve the quality of bat habitat. This would result from potentially creating or helping to maintain small openings in the forest canopy and within the longer-term, by augmenting existing quantities of snags, logs and green trees with defect within the treated stands potentially providing additional roosting opportunity for a number of bat species.

Red Tree Vole - (dusky sub-species) - (BS) and Survey and Manage

The majority of the proposed Wildlife Habitat Enhancement treatment units contain suitable habitat for the red tree vole and it is possible that portions of these areas are currently occupied by red tree voles.

No red tree voles or red tree vole nests were located within this area. Based upon the nature of the proposed wildlife habitat enhancement treatments, including the fact that a very small portion of the available habitat within a given stand would be impacted, the project would not be expected to impact the current or future suitability of the treated stands for use by red tree voles; the physical integrity of the treated stands to maintain and provide for expansion of a population of red trees would not be impacted. Impacts to individual red tree voles possibly occupying the area of the proposed action would be expected to be very unlikely as a result of implementing the proposed wildlife habitat enhancement treatments. Potential adverse impacts to tree voles are minimized by the inclusion of the project design feature that no tree which contains a suspected nest of any bird or mammal, or any adjacent tree would be treated.

Other Species of Concern

Roosevelt Elk and Black-Tailed Deer

It is expected that the Roaring Creek Wildlife Habitat Enhancement project would temporarily displace individual elk and deer as they react to the disturbance created by project implementation. This would not impact the health of the populations based upon the limited length of time of the disturbance and the fact that other, relatively undisturbed suitable habitat is present within the vicinity of the proposed action.

Overall, based upon the nature of the project, the proposed Roaring Creek Wildlife Habitat Enhancement project is expected to have little or no impact upon elk and deer and/or their habitats.

4.3.4 Soils

4.3.4.1 Affected Environment

The project area is in the same general area as Project 1, Commercial Density Management Thinning. The affected environment (setting, disturbance, and soils) in this project area is similar to Project 1 (refer to section 2.3.4.1) except that some of the soils are poorly drained and some occur on steeper ground, some of which are unstable.

4.3.4.2 Environmental Effects Alternative 1: No Action

Under the No Action Alternative, there would be no minor soil disturbance or additions of organic material into the soil surface from felling and topping trees. Current soil processes and conditions would continue to occur based on current conditions. Soils impacted from prior disturbance would continue to recover their productivity through natural restoration processes.

Cumulative Effects

There would be no soil disturbance therefore there would be no cumulative effect on soil resources. Current soil processes and conditions would continue to occur based on current conditions. There are no other land owners within the project area and BLM has no other plans in the project area for the reasonably foreseeable future.

4.3.4.3 Environmental Effects Alternative 2: The Proposed Action

Felling and topping trees would cause some minor and localized soil displacement/ compaction and add coarse woody debris and fine organic material. Addition of organic material would add nutrients to the site, a slight beneficial affect at the site scale. The project action would not have any measurable effect on the soil resource at the project or larger scale.

Cumulative Effects

Since there would be very little ground disturbance, the proposed action would not have a cumulative effect to soil productivity. There are no other land owners within the project area and BLM has no other plans in the project area for the reasonably foreseeable future. Current soil processes and conditions would continue to occur based on current conditions.

4.3.5 Water Resources

4.3.5.1 Affected Environment

The project area is in the same general area as Project 1, Commercial Density Management Thinning. The affected environment (setting, disturbance, streams, beneficial uses, and water quality) in this project area is similar to Project 1 (refer to 2.3.5.1) except that some of the soils are poorly drained and some occur on steeper ground, some of which are unstable.

4.3.5.2 Environmental Effects Alternative 1: No Action

Under this alternative there would be no direct effects to water resources. Trees would not be felled along streams that could interact with stream channels and collect sediment and debris. Streams disturbed from past management would continue to evolve towards a stable condition.

Cumulative Effects

Since there would be no direct effects to water resources, there would be no cumulative effect to water resources. Current hydrologic processes and conditions would continue. The existing vegetation and associated stand structure would be maintained.

4.3.5.3 Environmental Effects Alternative 2: The Proposed Action

It is anticipated that a small number of trees would be felled within Riparian Reserves; some of those would drop into stream channels. Shading along the project streams is currently adequate and felling a small number of scattered trees will not substantially alter streamside shading or water temperature. This action may cause a temporary pulse of sediment in a few places and minor damage to a few streambanks. Any sediment pulse created by the action would unlikely be visible more than 50 feet downstream. Adding wood to streams would add organic matter, increase hydraulic “complexity and habitat diversity at the site.

Cumulative Effects

The proposed action would not have measurable cumulative effects to water resources at the project scale and larger. Effects would be contained within the site level. The project action should enhance, to a small degree, the diversity and complexity of forest stands within the affected watershed. At the watershed scale, the diversity and complexity would be maintained.

4.3.6 Threatened or Endangered Fish Species or Habitat

4.3.6.1 Affected Environment

As the Wildlife Habitat Enhancement project is located in the same geographic area as the density management thinning, see section 2.3.4.1 for a description of the affected environment. There are three species of anadromous fish; Upper Willamette steelhead trout (*O. mykiss*), coho salmon (*Oncorhynchus kisutch*), and Pacific lamprey (*Lampetra tridentata*) known to inhabit the upper Tualatin watershed (including Roaring), as well as resident cutthroat trout, reticulate sculpins, and Western Brook lampreys. Of these species only Upper Willamette steelhead is currently listed under the Endangered Species Act as threatened.

4.3.6.2 Environmental Effects Alternative 1: No Action

Under this alternative the wildlife project would not occur and there would be no direct effects to fish species or habitat. Trees would not be felled in or along streams.

Cumulative Effects

There are no cumulative effects to T & E species as a result of the no action alternative. Current trends occurring on federal and non-federal forestlands would continue resulting in a general decrease in volume and abundance of LWD in the stream channel until such time as natural recruitment occurs on federal forestlands.

4.3.6.3 Environmental Effects Alternative 2: The Proposed Action

The creation of LWD (snags and downed logs) in Riparian Reserve verses the creation of Course Woody Debris (CWD) in upland areas has distinct differences in potential effects to Upper Willamette steelhead. The potential of effects to any fish species are only possible within the Riparian Reserve land use allocation and primarily only when trees are felled into streams with these fish. Some of the project areas are adjacent to areas potentially occupied by UW steelhead.

The effects anticipated from planned LWD additions to stream channels associated with the wildlife project where ESA species are located would range from an aversion response to the potential of mortality for a few individual fish. When these trees are felled these species may move away, either from a tree falling in the water or as a result of short pulses of sediment generated by the tree hitting the water. The loss of a few individual fish would not elevate concern for these species, their status or contribute to the need to change their listing under the Endangered Species Act. Any increase in sediment and turbidity would be small, of short duration, and localized. The timing of this restoration activity would primarily occur during ODFW'S instream work window (July 1 – September 30) unless an instream permit is obtained from the Oregon Department of Fish and Wildlife. Outside of the first site potential tree height there are no anticipated effects to ESA species from CWD additions or snag creation.

Falling and/or topping of selected trees directly into the stream channel would result in localized turbidity and it is not anticipated that this would exceed 2 hours in any 24 hour period. These actions would be implemented consistent with the Project Design Criteria contained in NOAA fisheries Biological Opinion dated December 12, 2006 for ‘USDA Forest Service (Pacific Northwest Region), USDI Bureau of Land Management (Oregon State Office), and the Coquille Indian Tribe for Fish Habitat Restoration Activities Affecting ESA and MSA-listed Animal and Plant Species found in Oregon and Washington.’

Several of the wildlife treatment units are adjacent to streams that may be occupied by anadromous salmonids, the addition of LWD into or adjacent to the stream has the potential of being both beneficial to habitat, and adverse to individual fish. Snag and LWD creation activities are likely to result in small, localized benefits to riparian and aquatic habitat by accelerating the growth of individual conifer trees and increasing the amount of LWD at individual locations.

Effects to substrate as a result of this action are not anticipated to occur until streams in the area rise to or near to bank full stage. These effects are anticipated to be both beneficial and adverse. As the streams in the area begin to rise during large winter storm events, sorting and routing processes of instream substrates would begin to occur, which would produce small pulses of sediment. However, with the addition of LWD the transport of gravels within this stream segment would change. The greatest change anticipated is the trapping and aggregation of the stream channel or the formation of pools adjacent to where LWD is added which would increase fisheries habitat. Short term, site scale adverse effects to Essential Fish Habitat would occur, however the long term effects are anticipated to be beneficial in nature. The addition of trees to identified stream reaches and riparian zones, but not including upland areas within the Roaring Creek Wildlife Project, would directly alter the current condition of the aquatic system. These LWD additions within the riparian zone or directly to the stream channel would provide a benefit to the matrix indicators for LWD, pool area, pool quality, and refuge habitat. In addition substrate conditions should improve due to the addition of these channel forming elements (trees). The addition of trees to the upland areas is not anticipated to have any affect to Upper Willamette steelhead or their habitat. The addition of LWD would redirect flow, reducing stream gradient and flows. As a consequence it would

diminished stream velocities, increase pools, trap more sediment and organic matter, and possibly reduce the width:depth ratio. The addition of wood would result in some minor channel adjustments, potentially temporarily increasing sediment and turbidity. These increases would be small and difficult to detect from background conditions.

Most of the effects would occur within the first year or two after project implementation. Over the long-term, logs and tree tops would continue to trap more wood and sediment. Riparian trees would continue to grow in size and fall in the channel, adding more complexity and stability to the channel.

The proposed action is unlikely to adversely affect water temperature. It is anticipated that a small number of trees would be felled within Riparian Reserves; some of those would be dropped into stream channels. This action may cause a temporary pulse of sediment in a few places and minor damage to a few stream banks. Any sediment pulse created by the action would not likely be visible more than 50 feet downstream. This action would not be large enough to change the current condition in the project area. The project action would result in an incremental improvement in water quality by increasing the amount of LWD in local streams. Most sediment would likely be stored in the upper reaches of streams where it would remain until a storm event occurs and transports it downstream, adding a negligible and indiscernible portion to the sediment load.

Cumulative Effects

The proposed project would improve the current condition of the stream channel and maintain it until such time as natural LWD recruitment from federal forest lands occurs. The current trend on surrounding private forestlands is timber harvest according to the provisions contained in the Forest Practices Act. This may result in little or no conifer retention in the riparian zone on private timberlands that would contribute to future LWD inputs to the stream channels.

4.3.7 Fish Species with Bureau Status and Essential Fish Habitat

4.3.7.1 Affected Environment

As the Wildlife Habitat Enhancement project is located in the same geographic area as the density management thinning, see section 2.3.4.1 for a description of the affected environment.

4.3.7.2 Environmental Effects Alternative 1: No Action

Under this alternative the wildlife project would not occur and there would be no direct effects to fish species or habitat. Trees would not be felled in and along streams.

Cumulative Effects

There are no cumulative effects to MSA species or EFH as a result of the no action alternative. Current trends occurring on federal and non-federal forestlands would continue resulting in a general decrease in volume and abundance of LWD in the stream channel until such time as natural recruitment occurs on federal forestlands.

4.3.7.3 Environmental Effects Alternative 2: The Proposed Action

Essential Fish Habitat Analysis

Essential Fish Habitat or EFH is defined as ‘those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10))’. There are no fish species with bureau status in the proposed project area. See section 4.3.6.3 for a more detailed description of the effects of the proposed action on fisheries resources.

Water Quality, Water Quantity, LWD, and Substrate Characteristics

Effects to substrate as a result of this action are not anticipated to occur until streams in the area rise to or near to bank full stage. These effects are anticipated to be both beneficial and adverse. As the streams in the area begin to rise during large winter storm events, sorting and routing processes of instream substrates would begin to occur, which would produce small pulses of sediment.

However, with the addition of LWD the transport of gravels within this stream segment would change. The greatest change anticipated is the trapping and aggregation of the stream channel or the formation of pools adjacent to where LWD is added which would increase fisheries habitat. Short term, site scale adverse effects to Essential Fish Habitat would occur, however the long term effects are anticipated to be primarily beneficial in nature. The addition of trees to identified stream reaches, riparian zones but not including upland areas within the Roaring Creek Wildlife Project are anticipated to directly alter the current condition of the aquatic system. These LWD additions within the riparian zone or directly to the stream channel would provide a benefit to the matrix indicators for LWD, pool area, pool quality, and refuge habitat. In addition substrate conditions should improve due to the addition of these channel forming elements (trees). The addition of trees to the upland areas is not anticipated to have any affect to fish or their habitat.

The addition of LWD would redirect flow, reducing stream gradient and flows. As a consequence it would diminished stream velocities, increase pools, trap more sediment and organic matter, and possibly reduce the width: depth ratio. The addition of wood would result in some minor channel adjustments, potentially temporarily increasing sediment and turbidity. These increases would be small and difficult to detect from background conditions.

Most of the effects would occur within the first year or two after project implementation. Over the long-term, logs and tree tops would continue to trap more wood and sediment. Riparian trees would continue to grow in size and fall in the channel, adding more complexity and stability to the channel.

The proposed action is unlikely to adversely affect water temperature. It is anticipated that a small number of trees would be felled within Riparian Reserves; some of those would be dropped into stream channels. This action may cause a temporary pulse of sediment in a few places and minor damage to a few stream banks. Any sediment pulse created by the action would unlikely be visible more than 50 feet downstream. This action would not be large enough to change the current condition in the project area. The project action would result in an incremental improvement in water quality by increasing the amount of LWD in local streams. Most sediment would likely be stored in the upper reaches of streams where it would remain until a storm event occurs and transports it downstream, adding a negligible and indiscernible portion to the sediment load.

Fish Passage:

The implementation of the wildlife habitat restoration project neither creates nor improves fish passage in the watershed and has no effect on EFH or MSA species.

Forage Species

Juvenile coho forage primarily on insects that fall into streams from adjacent riparian vegetation and drifting aquatic insects in the water column. Most of the riparian areas within the project area have mixed stands of hardwoods and conifers with a dense shrub under-story. Stream channels substrates

have a mix of gravels, cobbles and boulders that provide good quality habitat for macro-invertebrates. The potential removal of a few trees from areas of fully stocked streamside buffers would have an insignificant and discountable effect on forage species. The implementation of the wildlife restoration project would be beneficial to forage species by increasing the stream complexity and adding to areas of increased macro-invertebrates productivity (log jams).

Channel Geometry

The project action of adding large wood to channels as a result of the implementation of the wildlife restoration project could alter the stream flow and channel morphology at a very small scale. Additions of LWD would redirect flow, reducing stream gradient and flows. As a consequence it would diminish stream velocities, increase pools, trap more sediment and organic matter, and possibly reduce the width: depth ratio. The addition of wood may result in some minor channel adjustments, potentially temporarily increasing sediment and turbidity. These increases would be small and difficult to detect from background conditions.

Road Density

The Roaring Creek wildlife restoration project would have no effect on road density in the watershed. It neither constructs nor decommissions roads in the watershed.

Cumulative Effects

The proposed project would improve the current condition of the stream channel and maintain it until such time as natural LWD recruitment from federal forest lands occurs. The current trend on surrounding private forestlands is timber harvest according to the provisions contained in the Oregon Forest Practices Act. This may result in little or no conifer retention in the riparian zone on private timberlands that would contribute to future LWD inputs to the stream channels.

5. LIST OF PREPARERS

The following individuals participated on the interdisciplinary team or were consulted in the preparation of this EA:

Interdisciplinary Team Lead, GIS	Bob McDonald	<u>Environmental Coordinator</u>
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Outdoor Recreation and Visual Quality	Debra Drake	<u>Recreation Planner</u>

Appendix 1 – Public Comments to Scoping for the Roaring Creek Projects, Including BLM Responses

On October 3, 2006, a Scoping Letter was sent to 35 individuals, organizations and agencies. As a result of this scoping effort, one letter providing comments was received from Oregon Wild and there were several telephone calls requesting more information. All comments presented in this appendix are direct quotes from the comment letter received.

Project Record Document 15

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Thinning

“We encourage you to focus on young plantations, as they will benefit most from thinning and increased diversity.”

“In general, Oregon Wild supports thinning that enhances forest health. If treatments are proposed within LSR, we only support thinning that will benefit development of late-seral structure. Thinning benefits late-successional structure most when it happens in stands less than 50 years old.”

“Please use VDT for the proposed thinning, and plan to protect any remnant older trees and snags in the units. You can do this through a mixture of marking skips/gaps and DxD prescriptions with good results.”

BLM Response:

The stands proposed for treatment are relatively dense, single-storied 36- to 75-year-old Douglas-fir-dominated stands with openings and hardwoods in laminated root rot pockets. The proposal is for variable-density thinning in all the treatment areas, with variations in specific prescriptions based on existing stand characteristics. A detailed description of the proposed treatments can be found in EA sections 2.2.3 and 2.3.1.

Road Construction

“Oregon Wild believes it is possible for the BLM to conduct young stand thinning without extensive construction of new roads. For example, Eugene BLM planned the Upper Siuslaw LSR Restoration Project with five action alternatives. One alternative would thin 6525 acres and construct no new roads. Another would treat 5660 acres and construct no spurs over 200 feet.”

“The BLM should do an analysis that illuminates how many acres of thinning are reached by each road segment so that we can distinguish between short segments of spur that allow access to large areas (big benefit, small cost) and long spurs that access small areas (small benefit, big cost).”

“In such a heavily managed landscape, additional roads will almost certainly lead to significant cumulative effects to the watershed and forest vegetation.”

BLM Response: The Purpose and Need statements for the Density Management and Fisheries Habitat Enhancement projects identify specific objectives for roads and road management (*EA Sections 2.1 and 3.1*). *EA Sections 2.3.5 and 3.3.5* summarize the effects to water quality and peak flows resulting from construction of dirt surface spur roads, renovation of existing roads, and use of rock-surface roads as haul routes. Effects to soil are summarized in *EA Sections 2.3.4 and 3.3.4*.

Northern Spotted Owls and other Old-growth Species

“This area may be home to the rare dusky red tree vole. Please perform and document high quality surveys for this species.”

“Does the project area include suitable or dispersal habitat for Northern spotted owls? If so, how will the project impact this habitat?”

“In general, but especially if the area is LSR, impacts on old-growth species should be discussed in detail in the EA. This should include a functionality analysis of dispersal for the northern spotted owl between LSR’s and critical habitat units, and analysis of effects on such species as the goshawk, bats, Canada Lynx, woodpeckers, Pine Marten, California Wolverine, Red Tree Vole, Great Gray Owl, Pygmy Nuthatch, Bald Eagle and other special status species listed in applicable management plans. Special attention to snag habitat is also needed.”

BLM Response: *Section 2.3.1* in the EA describes the affected environment for wildlife, including Survey and Manage and ESA-listed species, in the Density management Project. *EA Section 2.3.2* describes the effects on wildlife for that project, including the effects of harvesting timber in the LSR.

Additional Issues

Fish & Wildlife – *“Special status species surveys must be completed prior to developing NEPA alternatives and before the decision is determined. On-the-ground field reconnaissance surveys must be done and used to develop NEPA alternatives.”*

“We are generally supportive of adding large wood to streams (if from an appropriate source), and creating snags and large woody debris within managed stands. Please describe the current and desired future condition of habitat in the area, and how proposed projects will change and attain these.”

Water Quality – *“Project analysis should separately discuss each of the Aquatic Conservation Strategy objectives (under the Northwest Forest Plan). Any commercial harvest activities or road construction in key watersheds or municipal watersheds should be avoided in order to protect water quality.”*

NEPA Alternatives – *“A full range of action alternatives should be considered for this project. These alternatives should include focusing on young stand restoration thinning and no road building.”*

BLM Response: Special Status Species surveys are discussed for the Density Management Treatment Project in *EA Section 2.3.3.1*. Alternative development for that project is addressed in *EA Section 2.2*. Aquatic Conservation Strategy Objectives for all the proposed projects are discussed in *EA Appendix 4*. There are no key watersheds or municipal watersheds in the project area.

Appendix 2 – Environmental Elements

Environmental Assessment Number OR-086-07-02

In accordance with law, regulation, executive order and policy, the interdisciplinary team reviewed the elements of the human environment to determine if they would be affected by the alternatives described in EA (environmental assessment). The following two tables summarize the results of that review. Those elements that are determined to be “affected” will define the scope of environmental concern.

Table 1. Critical Elements of the Environment. This table lists the critical elements of the human environment (BLM Handbook 1790-1) which are subject to requirements specified in statute, regulation, or executive order and the interdisciplinary teams predicted environmental impact per element if the alternatives described in Chapter 2 of the Environmental Assessment were implemented.

Critical Element of the Human Environment	Status 1/ Not Present 2/ Not Affected 3/ Affected	Interdisciplinary Team Remarks
Air Quality (Clean Air Act)	All Projects – Not Affected	<p>Project 1 - The proposed Density Management thinning has the potential to create slash and raise the fire hazard associated with landings, along roads, private property lines, and young plantations in the treatment areas. Depending on the size of the landings, or the accumulation of slash in these other potential high fire risk areas, burning may be conducted to reduce the accumulation of slash in these areas. Since burning would be conducted in accordance with the <i>Oregon State Implementation Plan</i> and <i>Oregon Smoke Management Plan</i> the impact of smoke on air quality is predicted to be local and of short duration. As such, the proposed action would have no adverse impact on air quality and would comply with the provisions of the Clean Air Act.</p> <p>Projects 2 and 3 - The Fish and Wildlife Habitat Enhancement Projects would slightly increase the amount of slash within the treatment areas, however, these accumulations would not be expected to result in an increase in fire hazard on the project level scale and the change would not be measurable on the watershed scale. Since no burning is recommended, the proposed action would have no adverse impact on air quality and would comply with the provisions of the Clean Air Act.</p>
Areas of Critical Environmental Concern	All Projects – Not Affected	There are no ACEC's within the project area
Cultural, Historic, Paleontological	All Projects – Not Affected	There are no cultural resources known or suspected to be present in the proposed project areas. A post-project survey would be conducted according the Protocol for Managing Cultural Resource on Lands Administered by the BLM in Oregon. Ground disturbing work would be suspended if cultural material is discovered during project work until an archaeologist can assess the significance of the discovery. The District Archaeologist may subsequently redesign the project or develop mitigation procedures to protect the cultural resource values present.
Native American Religious Concerns	All Projects - Not Present	There were no Native American religious concerns associated with any of the proposed projects identified during the public scoping period.
Prime or Unique Farm Lands	All Projects - Not Present	There are no Prime or Unique Farm Lands within the proposed project areas.

Table 1. Critical Elements of the Environment. This table lists the critical elements of the human environment (BLM Handbook 1790-1) which are subject to requirements specified in statute, regulation, or executive order and the interdisciplinary teams predicted environmental impact per element if the alternatives described in Chapter 2 of the Environmental Assessment were implemented.

Critical Element of the Human Environment	Status 1/ Not Present 2/ Not Affected 3/ Affected	Interdisciplinary Team Remarks
Flood Plains (Executive Order 11988)	All Projects - Not Affected	<p>Projects 1 and 3 do not have any flood plains located within the proposed project areas.</p> <p>Project 2- A small area of the Fish Habitat Enhancement treatment area would take place within flood plains. The proposed action, however, does not involve occupancy and/or modification of flood plains, and would not increase the risk of flood loss. As such, the proposed action is consistent with Executive Order 11988.</p>
Threatened or Endangered Plant Species or Habitat	All Projects - Not Affected	<p>For projects 1 and 2 partial surveys were conducted in Spring of 2006. No T&E species were located within the project areas surveyed. Additional surveys for projects 1 located within 1S-5W-sect. 19, 25 and 33 will be completed in Spring of 2007. All surveys required for project 3 will occur prior to any habitat disturbing activity and will be specific to species potentially affected.</p>
Threatened or Endangered Wildlife Species, Habitat and/or Designated Critical Habitat	All Projects - Affected	<p>Project 1 - Addressed in text (Section 2.3.2)</p> <p>Project 2 - Addressed in text (Section 3.3.2)</p> <p>Project 3 – Addressed in text (Section 4.3.2)</p>
Threatened or Endangered Fish Species or Habitat	Projects 1 and 2 - Affected Project 3 - Not Affected	<p>Project 1 - Addressed in text (Section 2.3.6)</p> <p>Project 2 - Addressed in text (Section 3.3.6)</p> <p>Project 3 – Project activities (girdling, topping and falling trees) are not expected to result in ground disturbance. There would be no effects on water quality, ESA-listed fish species or their habitat.</p>
Hazardous or Solid Wastes	All Projects – Not Affected	<p>None of the projects would generate hazardous or solid wastes in the project areas. The project areas are behind locked gates and are not accessible to the public, so there would be no increase in illegal dumping of waste as a result of the proposed projects.</p>
Water Resources (including ground and surface water quality)	Projects 1 and 2 - Affected Project 3 – Not Affected	<p>Project 1 - Addressed in text (Section 2.3.5)</p> <p>Project 2 - Addressed in text (Section 3.3.5)</p> <p>Project 3 – Project activities (girdling, topping and falling trees) are not expected to result in ground disturbance. It would not alter the current condition of the aquatic system either by affecting in-stream flows, physical integrity, water temperature, or the sediment regime.</p>

Table 1. Critical Elements of the Environment. This table lists the critical elements of the human environment (BLM Handbook 1790-1) which are subject to requirements specified in statute, regulation, or executive order and the interdisciplinary teams predicted environmental impact per element if the alternatives described in Chapter 2 of the Environmental Assessment were implemented.

Critical Element of the Human Environment	Status 1/ Not Present 2/ Not Affected 3/ Affected	Interdisciplinary Team Remarks
Downstream Beneficial Uses other than Fisheries. (See sections entitled “Fish Species with Bureau Status and Essential Fish Habitat” and “Threatened or Endangered Fish Species or Habitat”)	Projects 1 and 2 - Affected Project 3 - Not Affected	<p>Project 1 - Addressed in text (Section 2.3.5)</p> <p>Project 2 - Addressed in text (Section 3.3.5)</p> <p>Project 3 – Project activities are not expected to result in ground disturbance. There would be no impacts to water quality or downstream beneficial uses.</p>
Key Watershed	All Projects - Not Present	None of the proposed projects is located within a Key Watershed.
Wetlands (Executive Order 11990)	Projects 1 and 2 - Affected Project 3 - Not Affected	<p>There are small (<1 acre), seasonal, isolated wetlands scattered throughout the proposed project areas.</p> <p>Project 1 - Addressed in text (Section 2.3.5)</p> <p>Project 2 - Addressed in text (Section 3.3.5)</p> <p>Project 3 - Project activities (girdling, topping and falling trees) are not expected to result in ground disturbance. Nearly all activities will occur on uplands.</p>
Wild and Scenic Rivers	All Projects – Not Present	There are no Wild or Scenic Rivers located within the proposed project areas.
Wilderness	All Projects - Not Present	There are no Wilderness Areas located within or near the proposed project areas. The project area consists of O&C lands managed for permanent forest production.
Invasive, Nonnative Species (Executive Order 13112)	Projects 1 and 2 - Affected Project 3 – Not Affected	<p>Project 1 - Addressed in text (Section 2.3.8)</p> <p>Project 2 - Addressed in text (Section 3.3.8)</p> <p>Project 3 – Project design features such as girdling or felling of individual trees would not result in the type or amount of disturbance that would allow for an increase in populations of invasive, non-native species. Because these activities would occur within established native plant associations, existing competition from native populations would mitigate the establishment of any invasive, non-native species.</p> <p>There would be no ground disturbance in this project, so invasive, nonnative species would not be affected</p>
Environmental Justice (Executive Order 12898)	All Projects - Not Affected	The proposed projects are not anticipated to have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

Table 2. Other Elements of the Environment. This table lists other elements of the environment which are subject to requirements specified in law, regulation, policy, or management direction and the interdisciplinary teams predicted environmental impact per element if the alternatives described in Chapter 2 of the Environmental Assessment were implemented.

Other Elements of the Environment	Status 1/ Not Present 2/ Not Affected 3/ Affected	Other Elements of the Environment
Land Uses (right-of-ways, permits, etc)	All Projects - Not Present	There are no known land uses that would be affected by the proposed projects.
Mineral Resources	All Projects - Not Affected	There currently are no mineral leases within the proposed project areas that would be affected and at the completion of the proposed projects the areas would maintain their current suitability for mineral development opportunities.
Energy Resources	All Projects - Not Affected	There currently are no energy developments within the proposed project areas that would be affected and at the completion of the proposed projects the areas would maintain their current suitability for energy development opportunities. The proposed projects would have no effect on energy development, production, supply and/or distribution.
Fire Hazard	All Projects Not Affected	<p>Project 1 – Within the proposed Density Management Thinning the fuel load as measured in tons per/acre would increase to a minor degree in the 1 hour, 10 hour, and 100 hour (fine) fuels classifications immediately after treatment but would quickly return to pre-treatment levels (in less than 5 years) in all Density Management Thinning units. Design features require accumulations of slash in landing areas, along roads, private property lines, and young plantations in the treatment areas to be assessed following treatment. Depending on the size of the landings or the accumulation of slash in these other potential high fire risk areas, burning, or slash pullback may be conducted to reduce the accumulation of slash. With the small increase in fuel loading across most of the treatment areas, and the fuel reduction projects designed for the high fire risk areas it would not be expected that an increase in fire hazard would affect the environment on the project level scale, and the change would not be measurable on the watershed scale.</p> <p>Projects 2 and 3 - The Fish and Wildlife Habitat Enhancement Projects would slightly increase the amount of slash within the treatment areas, as measured in tons per/acre with the addition of large down logs to Roaring Creek. The small addition of large wood (1000 hour fuels) would not change the overall fuel loading to a point where it would increase the potential fire hazard.</p>
Rural Interface Areas	All Projects - Not Present	There are no mapped Rural Interface Areas located in the proposed project areas.
Soils (productivity, erodibility, mass wasting, etc.)	Projects 1 and 2 - Affected Project 3 - Not Affected	Project 1 - Addressed in text (Section 2.3.4) Project 2 - Addressed in text (Section 2.3.4) Project 3 - Project activities (girdling, topping and falling trees) would not result in ground disturbance or affect soil resources.
Visual Resources	All Projects – Not Affected	The proposed projects are located on lands managed as Visual Resource Management class IV, which allows for maximum modification of the visual resource.

Table 2. Other Elements of the Environment. This table lists other elements of the environment which are subject to requirements specified in law, regulation, policy, or management direction and the interdisciplinary teams predicted environmental impact per element if the alternatives described in Chapter 2 of the Environmental Assessment were implemented.

Other Elements of the Environment	Status 1/ Not Present 2/ Not Affected 3/ Affected	Other Elements of the Environment
Recreation	All Projects – Not Affected	The proposed projects are located on lands that are accessed through gates controlled by private holdings providing no public access. Scattered BLM ownership of small tracts further limits recreation potential in this area.
Special Status and SEIS Special Attention Plant Species and Habitat	Projects 1 – Affected Project 2 and 3 – Not Affected	<p>Project 1 - Addressed in text (Section 2.3.9)</p> <p>Project 2 – Surveys were conducted in Spring of 2006 and 2007. No SSS species were identified within the project area</p> <p>Project 3 – Based on design features such as “All felled trees would be selected and felled in such a way as to minimize impacts to existing decay class 3, 4, and 5 down woody debris which is greater than 15 inches in diameter” and consideration of minimal impact to the existing habitat this project does not trigger the need to survey as no action within the project design would contribute to the need to list any SSS species, but could have a positive influence by creating a more diverse plant association.</p>
Bureau Special Status and SEIS Special Attention Wildlife Species and Habitat	All Projects - Affected	<p>Project 1 - Addressed in text (Section 2.3.3)</p> <p>Project 2 - Addressed in text (Section 3.3.3)</p> <p>Project 3 - Addressed in text (Section 4.3.3)</p>
Fish Species with Bureau Status and Essential Fish Habitat	All Projects - Affected	<p>Project 1 - Addressed in text (Section 2.3.7)</p> <p>Project 2 - Addressed in text (Section 3.3.7)</p> <p>Project 3 – Addressed in text (Section 4.3.7)</p>
Forest Vegetation Associated with Late-Successional Reserves and Riparian Reserves	All Projects - Affected	<p>Project 1 - Addressed in text (Section 2.3.1)</p> <p>Project 2 - Addressed in text (Section 3.3.1)</p> <p>Project 3 – Addressed in text (Section 4.3.1)</p>

Table 3. Aquatic Conservation Strategy Summary. This table lists the four components of the Aquatic Conservation Strategy (ROD/RMP pp. 5-7), and the interdisciplinary teams predicted environmental impact per component if the alternatives described in Chapters 2, 3 and 4 of the Environmental Assessment were implemented.

Components	Consistency with ACS	Remarks /References
Riparian Reserves	Consistent	The proposed action is consistent for the following reasons: a watershed analysis has been completed; road and landing locations have been minimized in Riparian Reserves; wetlands have been avoided when constructing new roads; sediment delivery has been minimized to streams from roads.
Key Watershed	Consistent	The project area is not in a key watershed.
Watershed Analysis	Consistent	<p>A large number of the recommendations in the WA have been incorporated into the proposed action. These include but are not limited to:</p> <ul style="list-style-type: none"> *When conducting forest density management projects inside Riparian Reserves, leave a no-harvest vegetation buffer along all intermittent and perennial stream channels. *Where feasible, decommission or obliterate unnecessary or undesirable roads. *Protect all currently existing riparian vegetation. *When conducting density management projects inside Riparian Reserves, leave a no-cut vegetation buffer along all intermittent and perennial stream channels, lakes, ponds, and wetlands. *Explore partnership opportunities with other landowners to evaluate best areas for stream restoration. *Roads located in valley bottoms or those with an inordinate number of stream crossings are high priority for treatment. *The highest priority for riparian restoration projects are those streamside areas that are dominated by hardwoods or overstocked conifer stands that would benefit from thinning or underplanting. *Consider possible conversion or pocket planting of conifers along stream segments that are dominated by hardwoods. *Where feasible, avoid road-building activities within Riparian Reserves. *Evaluate existing roads and address any problem areas which may be in conflict with ACS objectives. *Consider density management thinning of well-stocked and over-stocked mid-age conifer stands, both inside and outside of Riparian Reserves, to accelerate size development and promote windfirmness in remaining conifers. *To reduce disease spread where infection centers are well defined, create small patch cuts in root disease centers and reforest these areas with species that are tolerant, resistant, or immune to <i>P. weiri</i>.
Watershed Restoration	Consistent	<p><u>Control and prevention of road related run-off and sediment</u> – Road related run-off will be reduced by spot rocking on haul routes where the subgrade is soft, ruts are developing, and near stream crossings. This spot rocking would occur prior to and during periods of haul. The road mileage in the watershed will be reduced by 8.0 miles. These actions will control and prevent road related run-off and sediment.</p> <p><u>Restoration of the condition of Riparian vegetation</u> – 244 acres of Riparian reserve will be treated with density management, to promote the development of late-successional forest characteristics on an accelerated timeframe. This will occur with negligible new road construction, or ground-based equipment off of existing roads and trails.</p> <p><u>Restoration of instream habitat complexity</u> – The proposed action includes 1.1 miles of fish habitat restoration which will increase LWD, pool area and quality, improve substrate storage and routing processes</p>

Appendix 3 – Past, Present, and Reasonably Foreseeable Future Actions for the Roaring Creek Projects

List of Other Actions – This list contains a number of identified ongoing and/or past, present or reasonably foreseeable future projects, activities or programs of work; it serves as a source or pool of activities that various specialists may have considered while describing affected environments or conducting effects analysis for the Roaring Creek Projects. Depending upon the resource and/or temporal or spatial scale of the analysis, projects to be considered include those projects which may continue to impact or are expected to impact the same resource at the same time and place as the proposed action, and/or have contributed to the current condition in a manner that still has impacts upon the same resources.

- An occasional discretionary O&C Road Use Permit to haul timber or rock on BLM-controlled roads.
- Road use and new road construction via non-discretionary right-of-way agreements with Weyerhaeuser and Stimson Lumber Co.
- Road maintenance (rock replacement, grading, ditch maintenance, drainage structure maintenance and replacement, landslide repairs) on BLM and private logging roads (OR-086-06-01 DNA).
- Issuance of Special Forest Products permits in compliance with the Special Forest Products program (CX # OR-086-02-02).
- Extensive large wood removal from streams (stream cleaning) – 1960s and 1970s.
- The Tillamook Resource Area has completed Activity Planning in the Upper Tualatin River, which includes the Roaring Creek Projects area. This planning process identified a number of potential projects which could be selected for development. Those projects included the already completed Scoggins Creek Timber Sale project and wildlife habitat enhancement work in the Scoggins Creek project area. The Roaring Creek projects are the other projects identified in the Activity Plan which have not yet been accomplished.
- There are several BLM commercial density management projects recently completed (since 1994), currently active or in various stages of the planning process which are located within and/or near the Upper Tualatin River or North Yamhill river areas. These projects all have similar objectives to promote late-seral habitat and include the following: Scoggins Creek (T1S, R5W, sec. 3, 5, 9 10, 15); Neverstill (T2S, R5W sec. 7); Cedar Creek Adaptive (T2S, R5W, sec. 17); and Blind Barney (T2S, R5W, sec. 7; T2S R6W, sec. 10; T1S, R5W, sec. 31; T1S, R6W, sec. 25).
- ODF has two known future timber sale projects near the Roaring Creek Project. The FY2007 “Sunday Drive” timber sale is a thinning operation totaling approximately 440 acres located in T1S., R6W., sections 12 and 13; and T1S.,R5W., sections 7 and 18. The FY2009 “Drive South” timber sale is also a thinning operation that totals approximately 400 acres located in T1S., R6W., section 24; and T1S., R5W., sections 18 and 19. In support of the “Drive South” timber sale ODF will be requesting to build road on BLM land in T1S., R5W., section 19 via Cooperative Rights-of-way agreement. The Roaring Creek Project would utilize this road to access treatment units 19-4 and 19-5.
- Historic BLM forest management practices in the area have had results which are still being realized today. Thousands of acres of mid-seral stands were commercially thinned in the late 1960s and the 1970s. Most of this thinning was light and uniform; most of the snags or green trees with defect which were present at the time of the thinnings within or near the thinning units were felled or harvested. Clearcut harvesting fragmented much of the existing mature forest habitat and reduced patch sizes.
- BLM implemented Wildlife Habitat Enhancement Projects within approximately 200 acres of mature conifer-dominated stands located in the Scoggins Creek watershed in 2004 and 2005. These projects primarily involved snag creation through girdling green trees within the live crown or at the base, along with some falling of green trees.
- On the south side of the Middle Tualatin sixth-field watershed, private timber harvest (clearcutting) and

road construction has occurred at an accelerated rate since 2003. This has occurred primarily on one of the industrial landowners in the area. The harvest rate has fallen in the past year as the majority of this landowner's mature timber in the area has been harvested.

- Less information is available on habitat altering management activities that are scheduled to occur on non-Federal (private) lands within the Analysis Area or across the larger landscape. The general trend on private land is one of harvest activities which result in decreasing quantities of mid- and late-seral habitat, that is, forest stands greater than 40- to 60-years-old harvested primarily through clearcut harvesting. The majority of the non-Federal forestland within the projects area is privately owned by industrial timber companies and is managed for timber production on relatively short rotations. This effectively results in the private land base being maintained in a continual condition of earlier seral stage habitats and generally precludes the development and/or maintenance of mid- or late-seral habitats and/or some habitat features such as large high quality snags. It is assumed that approximately 1,000 acres of non-federal forestland within the Middle and Upper Tualatin River sixth-field watersheds will be clearcut harvested within the next 10 years. It is also assumed that private timberlands will continue to harvest according to the provisions contained in the Oregon Forest Practices Act. This may result in little or no large conifer retention in the riparian zone on private timberlands that would contribute to future LWD inputs to the stream channels and/or riparian zone.

Appendix 4 – Aquatic Conservation Strategy Objectives

Table 1 - Documentation of Consistency with the Nine Aquatic Conservation Strategy Objectives for all Projects.

Aquatic Conservation Strategy Objective	Remarks (No Action Alternative addresses all projects)
<p>1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features.</p> <p><i>None of the Alternatives retard or prevent the attainment of ACS objective 1</i></p>	<p>No Action Alternatives: The No Action alternative would maintain the development of the existing vegetation and associated stand structure at its present rate. The current distribution, diversity and complexity of watershed and landscape-scale features would be maintained.</p> <p>Density Management Action Alternative: The proposed variable thinning in portions of the Riparian Reserve Land Use Allocation (Riparian Reserves) would result in forest stands that exhibit attributes typically associated with stands of a more advanced age and stand structural development (larger trees, a more developed understory, and an increase in the number, size and quality of snags and down logs) sooner than would result from the No Action Alternative. Since Riparian Reserves provide travel corridors and resources for aquatic, riparian dependant and other late-successional associated plants and animals, the increased structural and plant diversity would ensure protection of aquatic systems by maintaining and restoring the distribution, diversity and complexity of watershed and landscape features.</p> <p>Fish Habitat Enhancement Action Alternative: Current levels of LWD are severely depleted compared to historic conditions. The addition of LWD into Roaring Creek would help restore the diversity and complexity of watershed features to which native aquatic and riparian species are uniquely adapted.</p> <p>Wildlife Habitat Enhancement Action Alternative: Creation of CWD in the project area would enhance, to a small degree, the diversity and complexity of forest stands in the affected watershed. At the landscape scale, diversity and complexity would be maintained.</p>
<p>2. Maintain and restore spatial and temporal connectivity within and between watersheds.</p> <p><i>None of the Alternatives retard or prevent the attainment of ACS objective 2</i></p>	<p>No Action Alternatives: The No Action alternative would have little effect on connectivity except in the long term within the affected watersheds.</p> <p>Density Management Action Alternative: Long term connectivity of terrestrial watershed features would be improved by enhancing conditions for stand structure development. In time, these reserves would improve in functioning as refugia for late successional, aquatic and riparian associated and dependent species. Both terrestrial and aquatic connectivity would be maintained, and over</p>

<i>Aquatic Conservation Strategy Objective</i>	<i>Remarks (No Action Alternative addresses all projects)</i>
	<p>the long-term, as Riparian Reserves develop late successional characteristics, lateral, longitudinal and drainage connectivity would be restored.</p> <p>Fish Habitat Enhancement Action Alternative: Placement of logs would connect stream channels to larger floodplain areas.</p> <p>Wildlife Habitat Enhancement Action Alternative: Creation of CWD would improve connectivity within and between watersheds by enhancing habitat for late successional dependant species in the treatment areas.</p>
<p>3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.</p> <p><i>None of the Alternatives retard or prevent the attainment of ACS objective 3</i></p>	<p>No Action Alternatives: It is assumed that the current condition of physical integrity would be maintained.</p> <p>Density Management Action Alternative: Physical integrity of channels at existing stream crossings would be altered for one to several years following repair/maintenance. Within the road prism (estimated at 30 feet maximum width), the channel surface, banks and bed would be compacted (bulk density of soils increased by as much as 30%), vegetation disturbed or removed and the bed/banks within the road prism would be obliterated. Due to the stable nature of channels at these locations, little to no additional disturbance to channel morphology would be expected either upstream or downstream from the crossing.</p> <p>Fish Habitat Enhancement Action Alternative: LWD placements along Roaring Creek would reduce streamflow velocities and increase streambed roughness. Over time, log structures would trap additional wood and sediment moving downstream and increase channel stability and physical integrity of the aquatic system.</p> <p>Wildlife Habitat Enhancement Action Alternative: This project would have no effect on the physical integrity of the aquatic system; therefore the current condition would be maintained.</p>
<p>4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.</p> <p><i>None of the Alternatives retard or prevent the attainment of ACS objective 4</i></p>	<p>No Action Alternatives: It is assumed that the current condition of the water quality would be maintained.</p> <p>Density Management Action Alternative: No-cut buffers in Riparian Reserves would be maintained. The proposed temporary roads are on ridge top or mid-slope locations with no hydrologic connections or proximity to streams or riparian areas. Overall, these action alternatives would be unlikely to have any measurable effect on stream temperatures, pH, or dissolved oxygen. Sediment transport and turbidity in the affected watersheds is likely to increase over the short term as a direct result of road repair and construction, hauling and yarding in and around the Riparian Reserve LUA. Over the long-term (beyond 3-5 years), current conditions and trends in</p>

<i>Aquatic Conservation Strategy Objective</i>	<i>Remarks (No Action Alternative addresses all projects)</i>
	<p>turbidity and sediment yield would likely be maintained under the action alternatives.</p> <p>Fish Habitat Enhancement Action Alternative: Placement of LWD into Roaring Creek would improve water quality by providing some additional shade, restoring sediment transport and storage, and increasing the quantity and complexity of pool habitat.</p> <p>Wildlife Habitat Enhancement Action Alternative: This project would have no effect on water quality; therefore the current condition would be maintained.</p>
<p>5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.</p> <p><i>None of the Alternatives retard or prevent the attainment of ACS objective 5</i></p>	<p>No Action Alternatives: It is assumed that the current levels of sediment into streams would be maintained.</p> <p>Density Management Action Alternative: No-cut buffers in Riparian Reserves would be maintained (minimum of 60 feet in treatment areas). Dry season hauling would minimize sediment delivery. After the sale short-term localized increases in stream sediment can be expected during culvert removal and replacement, but BMPs and mitigation measures would be implemented to limit acceleration of sediment delivery to streams. As a result, it is unlikely that this proposal would lead to a measurable change in sediment regime, including increases in sediment delivery to streams, stream turbidity, or the alteration of stream substrate composition or sediment transport regime.</p> <p>Fish Habitat Enhancement Action Alternative: This project would result in short-term increases in sediment during log placement in Roaring Creek and road decommissioning. In the long-term, log structures would trap gravel and other substrate and the road would stabilize; therefore the sediment regime would be restored.</p> <p>Wildlife Habitat Enhancement Action Alternative: This project would have no effect on the sediment regime; therefore the current condition would be maintained.</p>

<i>Aquatic Conservation Strategy Objective</i>	<i>Remarks (No Action Alternative addresses all projects)</i>
<p>6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.</p> <p><i>Both the Action and No Action None of the Alternatives retard or prevent the attainment of ACS objective 6</i></p>	<p>No Action Alternatives: No change in in-streams flows would be anticipated.</p> <p>Density Management Action Alternative: Because the proposed project will remove less than half the existing forest cover, it is unlikely to produce any measurable effect on stream flows. Within the Riparian Reserve LUA, substantial portions of the riparian canopy would be retained, therefore maintaining riparian microclimate conditions and protecting streams from increases in temperature.</p> <p>Fish Habitat Enhancement Action Alternative: This project would have no effect on in-stream flows. It would improve the retention patterns of sediment, nutrient, and wood routing. Therefore the current condition would be maintained</p> <p>Wildlife Habitat Enhancement Action Alternative: The project would have no effect on in-stream flows.</p>
<p>7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.</p> <p><i>None of the Alternatives retard or prevent the attainment of ACS objective 7</i></p>	<p>No Action Alternatives: The current condition of flood plains and their ability to sustain inundation and the water table elevations in meadows and wetlands is expected to be maintained.</p> <p>Density Management Action Alternative: There would be no alteration of any stream channel, wetland or pond morphological feature. All operations, equipment and disturbances are kept a minimum of 60 feet from all wetlands and stream channels. Thus, the current condition of floodplain inundation and water tables would be maintained.</p> <p>Fish Habitat Enhancement Action Alternative: The addition of LWD in Roaring Creek would likely increase the frequency, and potentially the duration of floodplain inundation, as well as promote floodplain development.</p> <p>Wildlife Habitat Enhancement Action Alternative: This project would have very little effect on floodplains or water table elevation; therefore the current condition would be maintained.</p>
<p>8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands.</p> <p><i>None of the Alternatives retard or prevent the attainment of ACS objective 8</i></p>	<p>No Action Alternatives: The current species composition and structural diversity of plant communities will continue along the current trajectory. Diversification will occur over a longer period of time.</p> <p>Density Management Action Alternative: No-cut buffers would maintain structural diversity of plant communities within a minimum of 60 feet from all streams and wetlands in treatment areas. Thinning in Riparian Reserve LUA outside of the no-cut buffers</p>

<i>Aquatic Conservation Strategy Objective</i>	<i>Remarks (No Action Alternative addresses all projects)</i>
	<p>would help to restore species composition by allowing more understory development and structural diversity by creating horizontal and vertical variations that are currently lacking in the riparian treatment areas.</p> <p>Fish Habitat Enhancement Action Alternative: The species composition and structural diversity would be improved with the planting of shade tolerant tree species (western red cedar, hemlock, and spruce) and releasing conifers in riparian areas.</p> <p>Wildlife Habitat Enhancement Action Alternative: This project would have very little effect on the species composition and structural diversity of plant communities.</p>
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species. <i>None of the Alternatives retard or prevent the attainment of ACS objective 9</i>	<p>No Action Alternatives: Habitats will be maintained over the short-term and continue to develop over the long-term with no known impacts on species currently present.</p> <p>Density Management Action Alternative: The proposed action would have no adverse effect on riparian dependent species. Although thinning activities may affect invertebrates within the treatment areas, adjacent non-thinned areas should provide adequate refugia for the species. In the long term, the treatments would restore elements of structural diversity to treatment areas in Riparian Reserves. These attributes would help to provide resources currently lacking or of low quality, and over the long-term, would benefit both aquatic and terrestrial species.</p> <p>Fish Habitat Enhancement Action Alternative: Addition of LWD structures would provide more habitat for populations of native invertebrate and vertebrate riparian-dependent species.</p> <p>Wildlife Habitat Enhancement Action Alternative: Creation of CWD would provide more habitat for populations of native invertebrate and vertebrate riparian-dependant species.</p>

Appendix 5 – Literature Cited and/or Selected References

- Ares, et. al. 2005. Ground-Based Forest Harvesting Effects on Soil Physical Properties and Douglas-Fir Growth. *Soil Sci Soc Am J* 69:1822-1832
- Bailey, J.D., and J.C. Tappeiner. 1998. Effects of thinning on structural development in 40- to 100-year-old Douglas-fir stands in western Oregon. *For. Ecol. Manage.* 108: 99-113.
- Beschta, R. L., et.al. 1995. Cumulative effects of forest practices in Oregon: literature and synthesis. Oregon State University, Department of Forest Resources, Corvallis, OR.
- Carey, A.B. 1991. The biology of arbored rodents in Douglas-fir forests. USDA For. Serv. PNW Res. Sta. Gen. Tech. Rep. PNW-GTR-276. Olympia, WA. 46 p.
- Carey, A.B., D.R. Thysell, and A.W. Brodie. 1999. The Forest Ecosystem Study: background, rationale, implementation, baseline conditions, and silvicultural assessment. USDA For. Serv. Pacific Northwest Res. Sta. Gen. Tech. Rep. PNW-GTR-457. Portland, OR. 129 p.
- Chan, S.S., D.J. Larson, K.G. Maas-Hebner, W.H. Emmingham, S.R. Johnston, and D.A. Mikowski. 2006. Overstory and understory development in thinned and underplanted Oregon Coast Range Douglas-fir stands. *Can. J. For. Res.* 36: 2696-2711.
- Coe, Drew, 2004. The Hydrologic Impacts of Roads at Varying Spatial and Temporal Scales: A Review of Published Literature as of April 2004. CMER Report, Forest Practices Division, Dept of Natural Resources, Washington State. [online] URL:
<http://www.dnr.wa.gov/forestpractices/adaptivemanagement/cmer/finalreport1-4-05.pdf>
- Crookston, N.L., and A.R. Stage. 1999. Percent canopy cover and stand structure statistics from the Forest Vegetation Simulator. USDA For. Serv. Rocky Mtn. Res. Sta. Gen. Tech. Rep. RMRS-GTR-24, Ogden, UT. 11 p.
- Hadfield, J.S. 1985. Laminated root rot, a guide for reducing and preventing losses in Oregon and Washington forests. USDA For. Service, Forest Pest Management. Pacific Northwest Region, Portland, OR. 13 p.
- Hadfield, J.S., D.J. Goheen, G.M. Filip, C.L. Schmitt, and R.D. Harvey. 1986. Root diseases in Oregon and Washington conifers. USDA Forest Service, Forest Pest Management. R6-FPM-250-86. Pacific Northwest Region, Portland, OR. 27 p.
- Hann, D.W., Ritchie, M., Chao-Huan, W., and Zumrawi, A.A. 2006. ORegon Growth ANalysis and projection system growth & yield project for Northwest Oregon Forests (ORGANON). NW Oregon Version, Edition 8.1. Department of Forest Resources, College of Forestry, Oregon State University, Corvallis.
- Hawkes, V.C.. 2006. Tillamook Mollusk Surveys 2006: Roaring Creek Project. LGL Limited. Sidney British Columbia, Canada
- Hawksworth, J.T. 2000. Upper Tualatin-Scoggins watershed analysis. USDI Bureau of Land Management, BLM/OR/WA/PT-00/015+1792. Tillamook, OR. 222 p.
- Heninger, et al., 2002. Soil disturbance and 10-year growth response of coast Douglas-fir on nontilled and tilled skid trails in the Oregon Cascades. *Wildlife Monographs*. 149: 1-35.

Hostetler, B.B., and D.W. Ross. 1996. Generation of coarse woody debris and guidelines for reducing the risk of adverse impacts by Douglas-fir beetle. Unpublished paper, USDA Forest Service Westside Forest Insect and Disease Technical Center, Troutdale, OR. 6 p.

Hunter, M.G. 2001. Management in young forests. Cascade Center for Ecosystem Management. Communiqué No. 3. 27p.

Isaacs, F.B. and R.G. Anthony. January 11, 2007. Bald eagle nest locations and history of use in Oregon and the Washington portion of the Columbia River Recovery Zone, 1971 through 2006. Oregon Cooperative Wildlife Research Unit, Oregon State University, Corvallis OR.

King, J.E. 1966. Site index curves for Douglas-fir in the Pacific Northwest. Weyerhaeuser Company, Forestry Research Center, Centralia, WA. Weyerhaeuser Forestry Paper 8. 49 p.

McGaughey, R.J. 2002. Stand Visualization System Version 3.36. USDA Forest Service, Pacific Northwest Research Station.

Nelson, E.E., and T. Hartman. 1975. Estimating spread of *Poria weiri* in a high-elevation mixed conifer stand. J. For. 73:141-142.

Nelson, E.E., N.E. Martin, and R.E. Williams. 1981. Laminated root rot of western conifers. USDA Forest Service, Forest Insect and Disease Leaflet 159. 7 p.

Oregon Department of Environmental Quality (ODEQ). 2001. Tualatin River Subbasin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) [online] URL:
<http://www.deq.state.or.us/wq/TMDLs/willamette.htm#>

Oregon Department of Environmental Quality (ODEQ) 2004/2006. Oregon's 2004/2006 Integrated Report Database (includes water quality limited waters and 303(d) list) [online] URL:
<http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp>

Oregon Department of Fish and Wildlife (ODFW), Aquatic Inventory Project. 2006. Unpublished data and comment summaries from Physical Habitat Surveys in the Roaring Creek/ Tualatin River Basin.

Oregon Department of Forestry. January 2001. Northwest Oregon State Forests Management Plan, Final Plan. Oregon Department of Forestry. Salem OR.

Oregon Watershed Enhancement Board, *Oregon Watershed Assessment Manual*. 1999. [online] URL:
http://www.oregon.gov/OWEB/docs/pubs/ws_assess_manual.shtml

Rapp, V. 2002. Restoring complexity: second-growth forests and habitat diversity. Science Update Issue 1. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 10 p.

Rapp, V. 2003. New findings about old-growth forests. Science Update Issue 1. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 11 p.

Romero, Gresswell, Li. 2005. Changing Patterns in coastal cutthroat trout (*Oncorhynchus clarki clarki*) diet and prey in a gradient of deciduous canopies. (abstract)

Ruth, R.H., and R.A. Yoder. 1953. Reducing wind damage in the forests of the Oregon Coast Range. USDA For. Serv. PNW For. and Range Exp. Sta., Sta. Paper No. 7. 30 p.

Stednick, J.D. 1996. Monitoring the Effects of Timber Harvest on Annual Water Yield. *Journal of Hydrology* 176:79-95.

Thies, W.G. 1984. Laminated root rot: The quest for control. *J. For.* 82:345-356.

Thies, W.G., and R.N. Sturrock. 1995. Laminated root rot in western North America. *USDA For. Serv. PNW Res. Sta. Gen. Tech. Rep. PNW-GTR-349.* Portland, Oregon. 32p.

USDA - Forest Service - Siuslaw National Forest, USDI - Bureau of Land Management - Salem and Eugene Districts, and US Fish and Wildlife Service (The North Coast Province Interagency Level 2 Team). March 26, 2004. Policy for the Management of Potential Marbled Murrelet Nesting Structure within Younger Stands.

USDA - Forest Service - Siuslaw National Forest, USDI - Bureau of Land Management - Salem and Eugene Districts, and US Fish and Wildlife Service (The North Coast Province Interagency Level 1 Team). August 1, 2005. Biological Assessment of Fiscal Year 2006/2007 Activities in the North Coast Province which might disturb bald eagles, northern spotted owls or marbled murrelets. 88 pages.

USDA - Forest Service - Siuslaw National Forest, USDI - Bureau of Land Management - Salem and Eugene Districts, and US Fish and Wildlife Service (The North Coast Planning Province Interagency Level 1 Team). July 24, 2006. Biological Assessment of habitat-modification projects proposed during Fiscal Years 2007 and 2008 in the North Coast Planning Province, Oregon that would affect bald eagles, northern spotted owls or marbled murrelets or the critical habitats of the northern spotted owl or the marbled murrelet. 161 pages including appendices.

USDA Forest Service, and USDI Bureau of Land Management. 1998. Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area. USDA Forest Service and USDI Bureau of Land Management. 117 p.

USDA Forest Service, and USDI Bureau of Land Management. 1994. Standards and Guidelines for management of habitat for late-successional and old-growth related species within the range of the northern spotted owl. US Govt. Printing Office: 1994 - 589-111/00001. Region No. 10.

USDA - Forest Service and USDI - Bureau of Land Management. April 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 Standard 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, US Fish and Wildlife Service. January 1998. Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area. 117 pages + appendices and maps

USDA and USDI. September 2000. Management Recommendations for the Oregon Red Tree Vole (*Arborimus longicaudus*) version 2.0. 25 pages

USDA and USDI. October 2002. Survey Protocol for the Red Tree Vole (Version 2.1).

USDA and USDI. 2003. Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan (Version 3.0) 85 pages.

USDA Soil Conservation Service (Now known as the Natural Resources Conservation Service). 1982. Soil Survey of Washington County, Oregon.

USDA Soil Conservation Service (Now known as the Natural Resources Conservation Service). 1974. Soil Survey of Yamhill County, Oregon.

USDI Bureau of Land Management. 1992. Western Oregon Program-Management of Competing Vegetation. Final Record of Decision. Oregon State Office, Bureau of Land Management. BLM-OR-PT-92-36-1792. 108 p.

USDI - Bureau of Land Management. September 1994. Salem District Proposed Resource Management Plan / Final Environmental Impact Statement, Volume 1.

USDI - Bureau of Land Management. May 1995. Salem District Record of Decision and Resource Management Plan. Salem Oregon. 76 pages + appendices.

USDI. Bureau of Land Management. 2000. Upper Tualatin-Scoggins Watershed Analysis. Salem District BLM, Salem, Oregon. Unpublished document.

USDI - Bureau of Land Management. January 1997. North Yamhill Watershed Analysis. Salem District BLM. 175 pages + appendices.

USDI - Bureau of Land Management. February 2000. Upper Tualatin-Scoggins Watershed Analysis. Tillamook Resource Area, Salem District BLM. 177 pages + appendices.

USDI – US Fish and Wildlife Service. 1986. Pacific Bald Eagle Recovery Plan. US Fish and Wildlife Service. Portland OR. 160 pp.

USDI – US Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; determination of critical habitat for the northern spotted owl; final rule. 50 CFR Part 17. Federal Register, January 15, 1992. (Available on-line at <http://ecos.fws.gov/docs/frdocs/1992/92-874.pdf>)

USDI - US Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; final designation of critical habitat for the marbled murrelet; final rule. 50 CFR Part 17. Federal Register, May 24, 1996.

USDI - US Fish and Wildlife Service. May 13, 1997. Marbled Murrelet Critical Habitat Biological Opinion. USDI Fish and Wildlife Service, Portland , OR. 27 pp.

USDI - US Fish and Wildlife Service. September 1997. Recovery Plan for the Threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon and California. Portland Oregon. 203 pages + appendices. Region 1, Portland Oregon.

USDI - US Fish and Wildlife Service, Region 1. Portland Oregon. October 12, 2005. Letter of Concurrence for the Effects to Northern Bald Eagles, Northern Spotted Owls and Marbled Murrelets from the North Coast Province Fiscal Year 2006 - 2007 activities that may affect, but are not likely to adversely affect, due to disturbance activities, US Department of the Interior; Bureau of Land Management, Eugene District and Salem District, and US Department of Agriculture, Siuslaw National Forest (*FWS reference number 1-7-05-I-0665*). 28 pages.

USDI - US Fish and Wildlife Service, Region 1. Portland Oregon. October 4 2006. Letter of Concurrence for the Effects to Northern Bald Eagles (*Haliaeetus leucocephalus*), Northern Spotted Owls (*Strix occidentalis caurina*), and Marbled Murrelets (*Brachyramphus marmoratus*) from the North Coast Province Fiscal Year 2007-2008 activities that may affect, but are not likely to adversely affect, due to activities that modify habitat and create disturbance, U.S. Department of the Interior; Bureau of Land Management, Eugene District and

Salem District, and the U.S. Department of Agriculture; Siuslaw National Forest (*USFWS Reference Number 1-7-06-I-0190*). 27 pages.

USDI - US Fish and Wildlife Service, Region 1. Portland Oregon. October 17 2006. Biological Opinion for the Effects to Northern Spotted Owls (*Strix occidentalis caurina*) and Marbled Murrelets (*Brachyramphus marmoratus*) from the North Coast Province Fiscal Year 2007-2008 activities that have the potential to adversely affect, due to habitat modification and disturbance on U.S. Department of the Interior; Bureau of Land Management, Eugene District and Salem District, and the U.S. Department of Agriculture; Siuslaw National Forest (*USFWS Reference Number 1-7-06-F-0192*). 122 pages.

USDI – US Fish and Wildlife Service. 2007. Endangered and threatened wildlife and plants; Removing the Bald Eagle in the Lower 48 Stated from the list of Endangered and Threatened Wildlife; Final Rule. 50 CFR Part 17. Federal Register, July 9, 2007